CHOLERA.

THE LAWS OF ITS

OCCURRENCE, NON-OCCURRENCE

AND ITS NATURE,

BY

C. SPINZIG, M. D.

WITH ONE ILLUSTRATION.

ST. LOUIS, MO.
SOLD BY THE BOOK AND NEWS CO., 307 NORTH FIFTH ST.
1877.

AHNER, MENNING & CO., PRS., 211 Market Street.

8.

CHOLERA.

THE LAWS OF ITS

OCCURRENCE, NON-OCCURRENCE

AND ITS NATURE,

BY

C. SPINZIG, M. D.

WITH ONE ILLUSTRATION.

ST. LOUIS, MO.
SOLD BY THE BOOK AND NEWS CO., 307 NORTH FIFTH ST.
1877.

TO

E. H. GREGORY, M. D.,

Professor of the Principles and Practice of Surgery, St. Louis Medical College,

THIS MONOGRAPH

Is Respectfully Dedicated, as a Token of Esteem and in Acknowledgment of True Friendship,

By his former Pupil,

THE AUTHOR.

PREFACE.

The essay was written in the fall of 1876, but owing to circumstances of minor import, the publication was delayed until the present.

The subject matter of this treatise may be viewed as one of the articles in the series enumerated in the preface of my pamphlet, published 1874 under the heading "Epidemic Diseases", and which treated only of Yellow Fever.

It was thought requisite to give publicity to the essay, even at the present moment, principally for the reason that the views therein advanced, as to the causes of cholera, are gravely conflicting with those generally adhered to by the greatest majority of medical writers, but it is evident that by consecutively instituted correct observations, only the operations of physical laws can be recognized in the causation of cholera as well as other epidemic diseases; hence the principles, facts and proof submitted by this essay may not appear devoid of interest.

St. Louis, Mo., April 1877.

THE AUTHOR.

EXPLANATION OF THE WOOD-CUT.

The darkest shading denotes the greatest percentage of cholera cases.

The dark shading with perpendicular lines denotes a medium percentage.

The lighter shading with oblique lines denotes the lowest percentage.

The lightest shading with horizontal lines denotes that no cholera occurred.

The asteric denotes the City Directix (at Walnut street and Levee.)

By the interrupting dark line the Pacific Railroad is indicated.

The winding dark line, rather parallel with the Pacific Railroad, indicates Mill Creek and Mill Creek Sewèr, (in 1866 the sewer was only completed in the eastern section.)

The straight dark line, coursing from south to north, or parallel with Sixth street, denotes the "basis" or the representation of the City Directrix.

The dark line ascending from the basis, represents the profile elevation of the ground, of which the figures below express the hight in the number of feet.

The notation or scale in the southern margin indicates 50 feet to an inch.

The numbers in the northern margin read thus: 0,=City Directrix. No. 1=high water mark of 1844, viz: +7.58. No. 2 =average stage of water in the river, viz :—13,1. No. 3 =low water of 1863, viz :—33.81.

NOTE.—The data of the profile elevations were kindly furnished by the officers of the City Engineer's office.

Nicht mehr der Worte rednerisch Gepränge,
Nur der Natur getreues Bild gefällt.

Schiller.

(No more rhetorical or pompous wording,
But nature's true depiction pleases.

Schiller.)

Die Natur ist nur für diejenigen freigiebig, die sie zu ergründen und zu verstehen wissen." *Dr. Otto Ule:* "Die Erde."

(Nature is but generous to those who understand to explore and interpret it. *Dr Otto Ule:* "The Earth.")

CHOLERA.

"Die Wissenschaft hat die Aufgabe, nicht nur danach zu fragen, warum so viele Menschen an Cholera erkranken, sondern auch, warum so viele nicht erkranken."

PETTENKOFER.

(It is the task of science, not only to enquire why so many persons fall sick with cholera, but also: why so many do not fall sick with it. PETTENKOFER.)

BEFORE entering into the examination of the demonstrable causes of cholera, it will probably appear expedient to glance over the theory of so-called infection. Nearly universally is the doctrine adopted, that cholera originated from and is propagated by the "specific cholera poison;" that it has its chorological abode on the banks of the Ganges and that from thence it spreads, by virtue of an ontological X,[1] all over the earth's surface, "infecting" mankind, save those protected with "immunity."

Nevertheless authority of the highest order rank among its supporters and believers, still it must be rejected and regarded as totally inadmissible, owing to the antagonism to science thereby created, and to its entirely hypothetical nature. Again, particularly, as efforts are ventured with marked energy to make those airy notions the basis for re-establishing the barbarian measures of so-called preventives, viz: military cordons and quarantine restrictions (as preventives against cholera equally as savage and tyrannical as compulsory vaccination against small-pox,) and which are followed by the horrors that are —accidentally or wilfully—created during the periods of epidemics. If now the attention may be directed to the general features that are exhibited by cholera, it appears evident that this disease pertains to the class "choloses", which are peculiar to the summer or autumnal seasons or

[1] With some there is a trinity, viz: X, Y, Z. See Carpenter, London Lancet, Dec. 2, 1871, p. 771.

climates, and also never occur or prevail in the Catarrhalic Region or hibernal climates. Diseases of this class are extinguished by the normal winter season or climate (*i. e.* states of the weather normal to a given geographical locality and season.)

These facts compel us to acknowledge that cholera is a perverted physiological process of the human organism, produced by the estival (or its compensative) physical influence, and is thus, strictly speaking, far from being exclusively dependent on mere local or special causes, but, in the volume of its magnitude, on cosmical or meteorological influences. The local influences constitute the predisposing or general causes, and the cosmical, the exciting or special ("specific") causes. But by far the greater plurality of the medical world seems yet to be contented with the explanations and definitions given by contagionists, infectionists, or specificists, by means of their vague and inconsistent terms: "contagion," "miasma," and "infectious X," although to the physicist or scientist nothing more is expressed thereby than by the terms: necromancy or astrology. Still they are upheld, and attempts are being eagerly made to substitute them for scientific accounts.

In order to bring "system in this madness," by dialectic technicality, it is asserted: contagion is a "specific poison," to be generated *within* the human organism, but the infectious matter (miasma) to arise *external* to it.)[1] Both agencies are acknowledged as morbific entities, but whose nature (constitution) to be inexplicable and undemonstrable vailed in mystery, but endowed with infallibility for producing an epidemic at their occasional (periodical) prevalence. Such captious notions are boldly expounded, and with philosophical (?) numbness confidently believed in.

Now the question arises: must the minority of unbiased investigators shrink from such fabricated and spurious representation of state of things? the more so, as it (the minority) lacks the support of the so-called authorities, either literary or governmental, and still worse to be bare even of the sympathy of the professional fraternity in general. The answer is: NEVER! Nay, it is the more inspired with incessant activity, particularly as *it is the only exponent of truth and reality of natural phenomena, and thus intimately affiliated to mankind and identified with actual humanity.*

1 Pettenkofer, Cholera-Frage, 1873, p. 6.

In adherance to the philosophical conviction that within nature (and nothing is beyond it) everything is but natural, that thus analysis and explanations of the phenomena of nature are rendered attainable to man, and that by the progress of science the means and the methods will be further devised for ultimate demonstrations.

In this sense the attempt of this essay is ventured, to render comprehensible and intelligible what the process is, denominated in medical terminology "cholera;" in the manner (as an epidemic) it originates; by what its course is influenced, and its nature modified. Thus "knowledge alone would already constitute a power." [1]

Now, consulting the records of cholera, and comparing it with the meteorological peculiarities, season and climate that prevailed at the place and time where and when cholera has decimated the population, it can not fail to be noticed, as already indicated, this disease principally (i. e. exclusively) to occur in estival season or climate, [2] or where the normal season and climate is perverted, temporarily, instead of inclining to the hibernal, inclining to the estival climate, either on the continent or on the oceans. But if these assertions yet appear paradoxical, and not directly sustained in their historical extent, by recorded meteorological quotations, the fault is owing to the fact, that until but recently meteorological observations are made sufficiently extensive and minutely, to furnish ultimate evidence for decision in biological disputed questions; though the facts and data thereby expressed, notwithstanding in some measure, but relatively and incompletely, are however perfectly valid and conclusive. Would records be everywhere accessible, resembling in completeness and exactness the "Nederlandsch Meteorologisch Jaarboek," edited by Buys Ballot; "Jahrbuecher der k. k. Central-Anstalt fuer Meteorologie und Erdmagnetismus," by Carl Jelinek[3] and Carl Fristch, Vienna; "Daily Bulletin of Synchronous Weather Reports," War Department of the U. S. Army; "Preussische Statistik," edited by H. W. Dove; "Meteorologische Beobachtungen," by Prof. Dr. C. Bruhns, Leipzig, etc., and would embrace every principal part of the globe, direct facts—or facts in detail—could

---

1 Pettenkofer, l. c. p. 89.

2 Comp. Hirsch's Statistics of 341 Epidemics from all countries, exhibiting about one-half occurring in the months of July and August. Ziemssen, Specielle Pathologie, Vol. II, p. 381.

3 Died October 19th ult., aet. 54 years.

readily be adduced for elucidating the dependence (i. e. the occurrence) of cholera on meteorological influences. Although records of this description are not accessible without incumbrance, or only by being "favored," in order to compare meteorological tables with the cholera and non-cholera years of the various localities, enumerated in the chronological and chorological (historical) sketches[1] submitted; yet the abundance of facts available, based on general laws and on conventional details, is sufficiently extensive and explicit, and equally as forcible to prove the *physical* nature of the causes, and the *physical* nature of the process of cholera. Prior to the law of Copernicus (the earth to rotate around the sun), and even consecutively the greatest difficulty seems to have rested upon the minds in order to understand (perhaps it would be more correctly said: a selfish speculative unwillingness to acknowledge) simple and comprehensible phenomena in nature, and at the present day there is also a tendency afloat, to disregard a law of a similar character, expounded by Dove: the circuitous rotation of storms around the barometrical minimum; in the north hemisphere from right to left, and in the south hemisphere from left to right. Also the law of the equatorial ascending stream of heat, being the fundamental motor power and *conditio sine qua non* of atmospheric, general and collateral, perturbations that are characterized by the rotation of the earth around its own axis; their periodicity, caused by the perihelic and aphelic motion of the earth in its orbit, is ignored, and instead of it, by metaphysical aberration, pre-existing electricity is substituted as the impetus.[2] The errors attending the "specific infection theory" are similar to these perversions.

If it may be borne in mind, in conjunction with the law of the rotation of the earth, that "cholera spreads from east to west,"[3] or springing up under the current of the southern periphery of the anemone (in the north hemisphere,—precisely corresponding with the recent observations made at Madras by Cornish, see London Lancet, December 2nd, 1871, p. 782,) and then comparing the geographical points that are chronologically marked "cholera centres," the striking feature must be recognized *that by*

1 Comp Cannstatt, Spec. Pathol., second edit. Vol. II, I, pp. 427—432, and Ziemssen l. c. pp 346—358.

2 Comp. Sanno Solaro, Recherches des mouvements de l'atmosphere. Paris 1870. Also, Prof. Tice, St. Louis, Mo., Lect. on Weather Prognostications.

3 Lebert denies this. Comp. Ziemssen l. c.

way of rotation cholera has marked its course, in the same manner, and pursuant to the same law, as is pointed ou by Dove for the motion and rotation of storms. Thus it proves to be undisputably true, and the law is sweepingly commanding, that cholera only then and there occurs where essential meteorological influences condition either a temporary outbreak, or an uninterrupted existence.

Prejudiced and preconceived minds u ay echo from these utterances the impression as if it was here intended to convey the idea that the "cholera producing agency," probably is suspended in the atmosphere, carried by the winds, and precipitated at favorable localities. Certainly a greater error could not be entertained, and a more decided misrepresentation of the comprehensible laws, essential to the pathogeny of cholera, could not be committed. Since having endeavored to indicate the intimate connection of the operations of the fundamental laws of nature with the occurrence of cholera, and alluded, in but a general sense, to their incidental—however absolute—responses, no other result could be produced or to follow, than a diametrical antagonism to the "specific infection theory." Nevertheless efforts are made over and over again by infectionists, with an activeness symbolized by the inmates of the beehive, to force their theory into universal acceptance, although evidently done so, by many of them, against their better convictions, and knowingly in violation of approved laws of nature. Verily, the notions entertained of the fictitious entity: the "specific cholera poison"—said to be provided with portability, transmissibility, and with such potency as to resist the reactions of the laws of nature, to which otherwise everything else is subjected, solicit condolatory sympathy.

Adverting now to the examination of the various data in detail, upon which the theory dwells, advocated in this essay, there it cannot fail to be noticed that to meteorological influences the virtue is ascribed to be the principal generators of cholera, pursuant to their active part performed in morphology of the (here the sole object of interest) organic world. Owing to the physical constitution or transmutation (metubalean processes) which are manifested by organic structure under coercive influences, special ("specific") phenomena or processes occur sustaining the proof, indicated by the general analysis above submitted. Further may be brought to view that all the facts, which

are already, and yet shall be adduced, are tending to prove the unity or the mutual dependence of the laws and actions of nature in their ultimate or primitive relations, from which everything emanated; nature is thus found devoid of dualistic qualities, and of but physical constitution. Therefore life, health and disease, conforming with nature, are also but physical phenomena to which cholera is not exceptional. Combined influences that convert physiological into pathological processes, by means of a special mode of reaction, constitute the "specific poison," and the multitude of the created disturbance expresses the epidemic character. On the supposition of infection, it is asserted, that cholera only follows commercial highways, and thus only being traceable, yet the remarkable fact is not omitted to be mentioned, that nearly exclusively it is met with in valleys of rivers, on low and alluvial ground. It may also be observed principally to prevail within the "Dysenteric Region." Sometimes it spreads over into the "Enteromesenteric Region," but in the "Catarrhalic Region" it is not found to prevail. This feature (in reality a fundamental law in natural history of cholera) is well sustained by the evidences recorded, attending an epidemic in India, 1818. "On the 20th of July at Delhi it broke out, spreading in a northern direction over the plains of Rhatgaun, Patum and Repaul, but over the Himalaya Mountains it did not extend, thus Central Asia was not visited." [1]

Connecting with these important facts and potential evidence—or general law—with other features of atmospheric influences, that are of local origin or dependent on the topographical aspect of certain terrestrial sections, two additional—however equally fundamental—laws in the ætiology of cholera are thereby established, which indicate the tracts it follows in an epidemic occurrence. First, an atmosphere resting upon the earth's surface, is heated by the reflected and reverberated heat from the ground (soil), the degree of its temperature corresponds with the angle of reflection, pursuant to latitude, but the fluctuations—or an uncommonly elevated state of temperature—conforms with the interference—reverberation—of refrigeration (or declining from the state of the atmosphere of the Catarrhalic Region) on a parallel of the proximity to the level of the sea; owing to the lowest strata of the atmosphere being less read-

1 Cannstatt, l. c. p. 429, § 854. In the Madras Presidency of India cholera did not reach the altitude of 4000 feet. Lancet, Dec. 1871, p. 782.

ily carried off by the returning polar current (the continental or contre-trade wind?) Hence the air at such localities, comparatively speaking, is not ventilated, and consequently overcharged with exhalations from the soil, that are highly detrimental to health and life (the peculiarities of the Dysenteric Region). Second, the spreading (rather occurrence) of cholera in chronological rotation corresponds, near the littoral, with the directions of the contre- or continental tradewinds that arise from the warmer oceanic littoral current and sweep over the shores; after having lost a part of their caloric and moisture, in consequence of the continental excursion, they are attracted by the oceanic current again, but thus localities of deficient ventilation, will have undue elevation of temperature with a sultry state of the weather, owing to the reverberation of heat from the globules of moisture in the air. The rotatory progress is in opposite direction to the oceanic current. The spreading of cholera has proved to correspond fully with this law, and is exemplified by the epidemics in India and China in 1821–1823; the gradual progress of cholera has there been near the seashore, along the coast of the China Sea and the Pacific Ocean as high north as Peking. In America, by the epidemics of 1832 and 1833, the same law is verified: the progress of the disease rotated from Quebec, and by way of Boston in proximity of the coast southwardly to New Orleans and the city of Mexico. In the years 1821, 1822 and 1823, when cholera had spread from India through Persia, Syria, Turkey, over into Europe, the same law is again traceable, but in this course its rotatory occurrence coincides with the southern periphery of the anemone, primarily in a south-northwardly direction, and collaterally from east to west. Thus the occurrence of cholera is traceable, chronologically and chorologically, on an intelligent and natural basis.

It is thus an established law, that cholera nearly exclusively occurs during the warm seasons (summer and autumn,) and hence appertaining to the bilious disorders (choloses) which are climatical diseases peculiar to or naturally prevalent in the Dysenteric Region. If there are apparent exceptions, namely the epidemics at Moscow from September 1831 to March 1832, where, it is stated, the thermometer indicated (probably at one instance only) 35° (C.?)[1]; at Edinburgh and London, during February and

1 Acc. to Geigel but. 20 c. Comp. Ziemssen l. c., Vol. 1, p. 55.

March 1832; in the high latitude of Archangel, and as early as May 1831 or at the uncommon altitude of the city of Mexico in the summer 1833, it may be remembered that these localities are within the Enteromesenteric Region, (excepting Archangel which is at the inside of the boundary line of the Catarrhalic and Enteromesenteric Region,) where the weather is yet liable to great fluctuations, and thus it need not be hesitated to predict that the weather then and there has been irrelevant to the season and the ordinary climate. The extremes will have approximated a state of the weather natural to the Dysenteric Region, whereas they ought to have extended over into the Catarrhalic Region for absorption. Thus intense oscillations will have prevailed, contrasting widely with the normal temperature, of which the index is registered for Archangel at 0.68, and for the city of Mexico 12.70 (C.?) yearly mean,[1] for hot summers predispose to diseases of the tropic climate, but cold winters to diseases of the polaric climate, and thus diseases of both climates, — those excepted of the temperate zones, or of an equalized climate, — will occur and prevail in form of epidemics, that are technically termed exotic diseases.[2]

Before entering upon the consideration of the state of the atmosphere, which is essential to, or at least incidental with the occurrence of cholera, it appears important to glance over the character of the soil upon which are found a large number of the principal localities where cholera has decimated the inhabitants, and of which the exhalations contaminate the atmosphere, so as to be congenial to cholera epidemics.

To the extent capital evidence proves available, the fact is prominently conspicuous, these localities to be situated mainly upon low and alluvial ground, though Loondour emphasizes: cholera ascends to an altitude of 8000 feet[3] (indiscriminately to latitude ?), thus their boundary line does not extend over the Enteromesenteric Region, notwithstanding (with some of them) of their higher degree of north latitude (Archangel the exception.) The only locality, being visited by a cholera epidemic of this approximate altitude, is the City of Mexico—7008 feet, — but this

1 Mueller, Kos. Physik.

2 Fuchs, Medicinische Geographie, p. 95. Cannstatt, l c. also states: remittent, intermittent and climatic fevers in a hot climate aggravate to pernicious forms, to yellow fever, cholera and pest.

3 Cannstatt, l. c, p. 430.

place is found under 18.50° north latitude and 81.20° longitude of Ferro. And now remembering the law in geographical medicine, under the Equator the Dysenteric Region ascends to an altitude of 7500 feet, and the Enteromesenteric Region from thence to 8200 feet,—the City of Mexico, as will be observed—is thus located near the boundary line of the Dysenteric-Enteromesenteric Region. The distance from the surface of this station to the line of the Catarrhalic Region is about 1000 to 1100 feet in hight, hence a liability would prevail to occasional and sudden refrigeration, but owing to the basin-like form of its plateau, with the lake Tezcuco and orographical surroundings of considerable higher elevation, its atmosphere must, in a great measure, be moist and stagnant, and of circuitous undulation. These data account for the nearly double range of its annual mean temperature in comparison of Munich, to which place a perspective parallel would be admissible, owing to approximate geographical configurations, though Munich represents in medical geography a higher regional altitude than the City of Mexico, owing to its higher north latitude, and bordering within the Enteromesenteric Region, near the line of the Catarrhalic Region.

If with these two localities a third one, viz: Archangel, is compared, where cholera has not again occurred since 1831, the physiographical range of this disease may thus be indicated, because this point is at the highest north latitude (which is equal to the highest regional altitude,) where cholera ever has occurred. The altitude of Archangel is zero, or levelling with the surface of the sea, but pursuant to its latitude, it is located within the Catarrhalic Region at the Enteromesenteric boundary line.

By a graphical line of regional connection of these three points there would not be expressed great extremes of declination from their estival temperature, which would not be intense enough to produce cholera, if the orographical local influences would not be the cause of the diversity of the annual mean temperature, particularly contrasting at the City of Mexico.

But as diseases (e. g. cholera,) indigenous to the Dysenteric Region, occur at Archangel (although exceptional,) it is evident that sudden and intense fluctuations (elevations) of temperature have at such periods taken place (meteorological inequalities anomalously extending

over from the Enteromesenteric Region,) augmenting seriously the prevalence of deleterious exhalations from the alluvial (and paludal)soil, which have thus resulted in the development of the form of disease, corresponding in character with epidemic cholera, as are occasionally met with at the other two places.

For the purpose to illustrate the physiographical boundary line of the chorological range of cholera, it appears important here to allude to two cities—Salzburg and Insbruck—which are not so far from Munich, but have never yet been visited by cholera epidemics, notwithstanding both places have strong military garrisons, (thus liable to sudden changes in their population,) and are chiefly located upon river alluvium[1]. However the surface of the ground upon which they are situated, represents a high mountain plain of nearly 2000 feet altitude. Their geographical position is as follows: Salzburg in 47° 48′ lat. and 30° 45′ long. of Ferro, Insbruck in 47° 16′ lat. and 30° 04′ long. of Ferro—the latter city with a defined altitude of 1770 feet, and with an annual mean of temperature 7.46 (C.?). Thus both localities are fairly placed within the Catarrhalic Region.

To illustrate that within physiographical or chorological range of cholera alluvial soil or low ground appears as an essential auxiliary, or congenial in the causations of cholera, attention may be invited to the most noted localities where the disease is apt to rage, and which are here chronologically enumerated. They are of both hemispheres, and with which is given, in some measure, the notations of their latitude, longitude and altitude; a partial geognostical and hydrographical sketch in relation to the soil upon which they are situated and by which they are surrounded, also the annual mean of temperature[2].

Calcutta, on the Hoogly river, (branch of the Ganges) and on rather paludal ground. In 22° 38′ latitude, 88° 20′ longitude, 80 feet altitude, and with 22° 40′ mean of annual temperature.

---

1 Pettenkofer l. c. p. 85.

2 The quotations of the temperature and some of the latitude, longitude and altitude are reproduced from Mueller, Kos. Physic.

The degrees of temperature, as I surmise, are expressed in accordance to the Celsius (=100) Scale. The other markings, viz: "O." or " — " stand: "O" for no altitude, and " — " where altitude was not ascertained. The longitude is reckoned from Greenwich, unless specially mentioned.

Delhi, on Deschamuna river, located on and surrounded by a plain. 28° 36′ lat., 77° long., 827 feet altitude.

Madras, on sea shore (or nearly so.) 13° 4′ lat., 80° 19′ long., 0 altitude, 22° 20 ann. mean temp.

Bombay, on sea shore (or nearly so.) 18° 56′ lat., 72° 54 long., 0 alt., 21° 81′ ann. m. temp.

Aracan, *Penang*, on sea shore. 0 alt.

Canton, on one of the arms of the Si-Kiang river, in a valley 23° 8′ lat., 113° 16′ longitude, — alt., 16° 83′ ann. m. temp.

Peking, on the Peiho river, in a valley, and surrounded by a plain of partially paludal and partially sandy soil. 39° 54′ lat., 116° 26′ long., — alt., 10° 13′ ann. m. temp.

Bushire, on sea shore of Persian Gulf. 29° 0′ lat., 53° 0′ long., — alt.

Bagdad, on Tigris river, in a valley, and surrounded by a plain. 33° 20′ lat., 44° 24′ long., — alt., 18° 52′ ann. m. temp.

Aleppo, on Kowaik river, in a plain-like valley, partly hilly. 36° 20′ lat., 37° 36′ long., 348 feet alt.

Cairo, on river Nile, near the estuaries and upon low and plain-like ground. 30° 2′ lat., 29° 48′ long., — alt., 17° 84′ ann. m. temp.

Astrachan, at mouth of river Volga, on Caspian Sea. 46° 21′ lat., 48° 8′ long., — alt., 8° 02′ ann. m. temp.

Orenburg, on Ural river, in a valley. 53° lat., 70° 20′ long., 87 feet alt.

Constantinople, on Bosporus and Sea of Marmara, and partially located upon hills of gentle declivity. 41° 0′ lat., 29° 1′ long., — alt., 10° 87 ann. m. temp.

Moscow, on Moscowa river, in a valley. 55° 45′ lat.' 38° 38′ long., 380 feet alt., 3° 57′ ann m. temp.

St. Petersburg, at mouth of Newa river and Gulf of Finnland; located upon and surrounded by rather paludal soil. 59° 56′ lat., 30° 18′ long., 0 alt., 3° 38′ ann. m. temp.

Archangel, on mouth of Dwina river and White Sea; located on paludal soil. 64° 32′ lat., 40° 33′ long., 0′ alt., 0.68 ann. m. temp.

Warsaw, on the Weichsel river, and surrounded by plains. 52° 20′ lat., 20° 40′ long., 305 feet alt.

Berlin, on the Spree river, surrounded by sandy plains. 52° 30′ lat., 13° 24′ long., 100 feet alt., 7° 18 ann. m. temp.

Vienna, on Danube river and in a plain-like valley, near the centre of a basin in the tertiary formation, rich of fossil shells. 48° 13′ lat., 16° 23′ long., 450 feet alt., 8° 46′ ann. m. temp.

Munich, on the Isar river and in a plain of calcareous, pebbly soil. 48° 9′ lat., 11° 36′ long., 1573 feet alt., 7° 28, ann. m. temp.

London, near mouth of Thames river, in a plain-like valley, which rises on the north bank as it recedes from the water 36 feet pro mile; on the opposite shore flat, and in some places below high water tide. 51° 30′ lat., 0.5 long., — alt., 8° 28′ ann. m. temp.

Edinburgh., 1½ miles distant from "Frith of Forth"-(estuary?) and located upon rather undulated ground. 55 58′ lat., 3° 11′ long., 220 feet alt., 6° 72 ann. m. temp.

Calais, on sea shore. 50° 57′ lat., 19° 45′ long. of Ferro.

Paris, on the river Seine, the ground declining in the northern direction plain-like, in the southern and eastern direction it is undulated. 48° 50′ lat., 2° 20′ long., 114 feet alt., 8° 58′ ann. m. temp.

Lisbon, on and near the mouth of Tejo river. 38° 42′ lat., 8° 30′ long., of Ferro, 13° 07′ ann. m. temp.

Porto, on and near the mouth of Douro river. 40° 32′ lat., 8° 58 long. of Ferro.

Madrid, on Manzanares river and on high table land. 40° 25′ lat., 14° 0′ long. of Ferro, 1949 feet alt., 11° 63 ann. m. temp.

Sevilla, on the river Guadalquivir, in a plain-like valley. 37° 23′ lat., 11° 40′ long. of Ferro.

Barcelona, on seashore. 40° 43′ lat., 19° 50′ long. of Ferro, 13° 79 ann. m. temp.

Rome, on the river Tiber, and partially surrounded by paludal soil. 41° 54′ lat., 12° 25′ long., 160 feet alt.

Genua, on seashore. 44° 24′ lat., 8° 54′ long., 13° 68′ ann. m. temp.

Florence, on Arno river, in a valley. 43° 47′ lat., 11° 15′ long., 220 feet alt., 12° 11′ ann. m. temp.

Naples, on sea shore. 40° 52′ lat., 14° 15′ long., 12° 25′ ann. m. temp.

Quebec, on St. Lawrence river, valley, but resembling tableland. 46° 48′ lat., 71° 17′ long., 4° 38′ ann. m. temp.

Boston, on shore of Massachusetts Bay. 42° 24′ lat., 53° 42′ long. west of Ferro, 0 alt.

New York, on the peninsula between Hudson and East rivers, and on the shore of New York Bay. 40° 43′ lat., 74° 1′ long., 0 alt., 8° 7′ ann. m. temp.

Baltimore, on Patapsco river, which enters three miles distant the Chesapeake Bay. 39° 18′ lat., 76° 35′ long., 0 alt., 9° 53′ ann. m. temp.

Washington, on Potomac river, valley. 38° 40 lat., 59° 24′ long. west of Ferro.

St. Louis, (in reference to the epidemic of 1866) on Mississippi river, valley; located on right bank, upon subsoil limestone rock; left bank forms a plain-like basin of rich alluvial and partially paludal ground (soil.) 38° 36′ lat., 89° 36′ long., 550 feet alt., 55° 6′ (of F. = 12° 90′ C.) ann. m. temp. These *data* are copied from Dr. Engelmann's table of a 30 year mean, published in St. Louis Med. Reporter, Jan. 15, 1867.

New Orleans, on the left bank of the Mississippi river and upon paludal soil. 29° 58′ lat., 90° 7′ long., 0 alt., 16° 80′ ann. m. temp.

Havana, on seashore (Cuba.) 23° 9′ lat., 82° long., 20° 07′ ann. m. temp.

Mexico City, nearly adjoining Lake Tezcuco, on a plain-like basin. 19° 26′ lat., 99° 6′ long., 7008 feet alt., 12° 70′ ann. m. temp.

The geographical data adduced are intended to verify the occurrence of cholera, where exhalations of the soil overcharge the atmosphere with such impurities, that lessen materially its oxydizing property by means of the displacement of ozon or reversion of positive electricity; also attributing largely to undue elevation of temperature, by means of reverberation of the solar heat, and to diminution of barometrical pressure, thus seriously interfering with (i. e. preventing) the transition of the winds (cosmographical ventilation.)

The deleterious effects of such influences on the human organism constitute the predisposing causes by which the force of resistance is gradually overcome. If, consecutively, intense meteorological oscillations will react, the normal physiological chemical processes in man suffer perversion, turned into morbid processes, designated, under manifestations of characteristic symptoms, cholera.

It is not to be supposed, that those who are captivated by the "specific infection theory," will accede to views here uttered, for Buffon's words: "La vraie philosophie est de voir le choses telles qu'elles sont," do not apply to them; they believe in an "X", the idol of implicit faith, where science is vanished and truth perverted.

The same venomous cry, shouted forth from motives of dotated interest, and to exercise arbitrary violence, is still raised against the efforts to reveal nature's truths, as it has characterized all epochs of history of civilization, *when an understanding of the laws and phenomena of nature was to take the place of an unapproachable mystery*, the archæus of fiction (= to cholera X.)

Fiction is always associated with inhumanity and cruel arbitrariness, exercised under council of the 'specific infection theory", for inst.: military cordons, quarantine restrictions, disinfection, and all the horrors and calamities following upon the general confusion, willfully created—in the majority of instances—at the outbreak of epidemics.

An incidence for illustration may properly here be adduced, which is of the most recent occurrence: In Baltimore a woman was abandoned and died *while she was left entirely alone in a house, on the rumor that she had yellow fever*, but six cart-loads (!) of chloride of lime and other disinfectants were scattered in the adjacent streets, *which looked as if a snowstorm had taken place.* (St. Louis Daily Journal, Sept. 17, 1876.)[1]

The assertions, even made with emphasis, by Watson, Cannstatt, Niemeyer, Lebert and others, that cholera would occur irrespectively of climatic, seasonal and terrestrial influences, would also transplant from one place to another, contrary to all meteorological peculiarities or changes, may now be fully contradicted. Also the opinion expressed by Henoch: "the reason why cholera epidemics do occur, would remain a *riddle*[2], and definite ætiological causes could not be given."

---

1 Another case in point, illustrating the cruel, but lega consequences, which would be more befitting to the barbarous and arbitrary deeds of the middle ages, following the belief of the phantom of specific "infection," is the following: A woman pawned two blankets to procure food for herself and her sick child, as she suffered from extreme poverty; but upon the report that her child was afflicted with smallpox, she was arraigned before a London magistrate and fined five pounds (=$25), for having trespassed a law, prohibiting to dispose of articles by which, as is feared, an "infectious disease" could be transmitted. The pitiable woman, being unable to pay the fine, was hence condemned to two months imprisonment. (London Lancet No. 1., Jan. 6, 1877, p. 25.)

2 A "riddle" are impelled phenomena, beyond immediate explanation, but are the effects of the operation of known causes. A riddle is therefore a mere deficiency or relativeness in man of synthetical analysis. Haeckel, Natuerliche Schoepfungsgeschichte, p. 28.

In behalf to the present state of science, especially to the progress made in physiological chemistry, natural philosophy, and the extensive data gained by corrected and properly designed, now universally instituted meteorological observations, the "riddle" of cholera admits of ready solution, and "definite ætiological moments" are now in sufficient abundance to the disposal of medical science.

Re-examining the various localities enumerated in the above list, most all of which will be found to present topographic-geognostical and orographical conditions, under which the kind as well as the quantity of deleterious influences are developed, which in co-operation with intense meteorological oscillations, the nature of which also already indicated, will produce epidemic cholera.

It is a law, probably generally conceded to, that during the summer solstices the solar rays fall upon the earths surface in an acute angle, and to the angle of incidence corresponds the angle of reflection. Again, in proportion as localities, or their respective latitude, recede from that of Archangel towards the Equator, in equal ratio the temperature of the atmosphere (resting upon such locality) is elevated at the level of the sea,—though isothermal lines, as parallel lines, do not everywhere correspond with this axiom—yet the frequency of the occurrence of cholera—as also the intensity of reaction — corresponds with this law. The verification may be obtained by glancing over the geographico - chronological sketches, given by Cannstatt and Lebert, vide Ziemssen.[1]

The same law applies to altitude. Frequency and intensity of cholera will be found in strict correspondence with the region receding from the boundary line of the Catarrhalic Region, and approaches the lower strata — or the level of the sea—of the Dysenteric Region also inclining simultaneously towards the Equator.

In point of dispute it may be good practice to adduce corroborating proof, as the laws here pointed out, will likely meet with an attempt of refutation, because the natural consequence of their sustained predominance would be a total demolition to the "specific infection theory", and a sensitive submission of fiction or speculation would not appear gratified by mere nature's truths, or by the laws of reality.

---

1 l. c — The history of the cholera epidemic of 1873 in the United States, prepared under direction of the Surgeon General of the U. S. Army, contains apparent diversities, but in the totality of its value it constitutes no exceptions.

Now the proof—which is stronger than the "Pillars of Hercules," as it is a universal law—is, that, indicated by the recorded observations of Lebert,[1] viz: in central Europe (Switzerland) the occurrence of cholera has never as yet reached over an altitude of 600 to 700 "metre" (= 1954.20 to 2279.91 Engl. feet); corroborated by the statements of Pettenkofer,[2] with reference to the city of Salzburg and Insbruck, even the latter place having but an altitude of 1770 feet. If now these absolute altitudes are transformed into relative altitudes or regional locations, defined by the respective degree of latitude (here 47°), and representing the average hight (for Switzerland) 2000 feet, the lower strata of the Catarrhalic Region are thus reached, or the region which is beyond the physiographical aerea of cholera territory; and thus again: the law of regional limitation, or that of the climatical dependence of the occurrence of cholera, is effectively sustained, contradicting the axioms of the "specific inspection theory" expressed by Watson, Cannstatt, Niemeyer, Lebert, etc.

Specificists and infectionists, notwithstanding confronting these fundamental and commanding laws, still with audacity assert: Climate and season can not be recognized in the ætiology of cholera; simply owing to the incidence, yet but cursory noticed, cholera to have prevailed at Moscow when the thermometer indicated 0.36′ (C.?) — the annual mean temperature being 3° 57′—, and again at Calcutta, where the annual mean temperature is 22° 40′ (summer maximum 43° C.); but the other differential meteorological oscillations that prevailed prior and during the epidemics of these two localities, which represent extremes, are not mentioned. The apparent contradicting data of Moscow and Calcutta seem to advance a plausibility, as if temperature and other states of the weather were immaterial in the development or maintenance of cholera epidemics, as an extraordinary wide range of temperature (from 0° 35′ to 43° C.) is observed during the prevalence of cholera, but meteorological oscillations by no means occur in one locality of this range, and at Moscow therefore fluctuations do, perhaps, not range wider than from 0° 35′ to 5° 90′ (C.), but within this range of perversions as to season are taking place, cholera may

1 vide Ziemssen, l. c.
2 l. c.

certainly follow. In Calcutta, probably, upon mere sudden reduction of the maximum of the summer heat, as an exciting cause, cholera will follow. The law is expressed by the facts observed at the "dry and hot" Pondschab (Punjab,) where the monsoon "brings the cholera."[1]

Thus again the law of the dependence of cholera epidemics upon meteorological oscillations, conducive to irrelevant seasonal or climatical influences, is corroborated; the fact once more lucidly illustrated, that the ætiological moments of cholera, irrespective to the wide meteorological ranges in the totality of the aerea of its territory, apparently contradicting, if applied to one locality, are to be found as based upon the following law: If in a climate, normally related to that of the hibernal solstices, or to that of the "Catarrhalic Region", limited though unseasonal fluctuations take place (i. e. inclining to estival solstices, equatorial climate, or that of the "Dysenteric Region,) or if reversedly in climates of the estival solstices, equatorial, or of the "Dysenteric Region" climatical characteristics suddenly set in and prevail, normally pertaining to the "Enteromesenteric" or "Catarrhalic Regions", or to the hibernal solstices, morbid processes in the human organism of the respective inhabitants, designated cholera, will follow as one of the natural consequences. The comparative data, further on submitted, in reference to the City of St. Louis, will also give direct expression in proof of the same law.

Impurities, foreign to the composition of the atmosphere, imparted to it by the exhalation of the soil, in a ratio the soil is adapted to emit such impurities, and are augmented by inhabitation, ventilation is thereby interfered with. They again constitute predisposing causes, and when the disease occurs in an epidemic form, the rate of mortality will be in an exact ratio to the rate of impurity. This fact will be illustrated with the greatest precision by representation of the principal section of the City of St. Louis, found further on, which exemplifies the influence of the soil and that of habitation."[2]

Nearly every one of the localities named in the statistical table, visited by cholera epidemics, will be found

---

1 Pettenkofer, l. c. p. 58. The same observations are made in Cochinchina, see Armand: Climatologie generale du Globe, p. 455—458.

2 Also comp. "Cholera Epidemic of 1873 in the United States," pages 240 & 244.

located upon alluvial ground, or principally upon post tertiary (recent) formations, also presenting, but exceptionally, a minimum altitude.

They are found located either in valleys, basins, or on plains, where evaporation and the streaming of atmospheric currents are depressed to the minimum, in consequence of which the baneful substances (elements of the disintegrative—regressive—metamorphosis)—carbo-hydro-ammoniacal gasses—imparted to the air from the soil, cannot be carried off; if then the atmosphere suffers to be overheated, and the impurities augmented, which naturally takes place under conditions of this description and during the summer solstices,[1] the volume of the air becomes highly expanded, its specific gravity and its constitution for oxygenating the blood in man, by respiration, sensibly reduced, and thus causing a serious interruption of the circulation and an abnormal composition of the blood. The normal synthetic-physical constitution of the air is thus altered so materially, as merely to exhibit the extreme minimal percentage of positive electricity (positive atmospheric electricity may be regarded synonymous with atmospheric ozon.)

Albuminates, as amorphous substances (i. e. in a state of a suboxide of hydrocarbons with ammonia ?) are highly charged with C. O_2,[3] and thus under a deficiency of an admixture (displacement) of Na. Cl. with an application of elevated temperature are prone to coagulate. (Aquous solutions of albumen indicate traces of coagula at a temperature of 58° F., and when a solution of Na. Cl. of moderate concentration is added, then only at 150° F.[4]) They also coagulate under the reaction of negative (or minimum of positive) electricity, which is well exemplified by the curdling of milk shortly prior or during the development of a thunderstorm; by the formation of thrombi and coagula in

1 Investigations made at Munich and Dresden exhibit the highest percentage of C. O.[2] of the soil synchrononsly with the maximum of temperature of the air and the soil (in the month of August.) Pettenkofer, Populaere Vorlesungen, Heft 1, p. 95.

2 In proof of this axiom the tables of positive electricity, corrected by Dr. Wislicenus of this city, and published in the "St. Louis Medical and Surgical Journal," may be examined, particularly the quotations for the months of June, July, August and September, as during the warm (hot) months the air is overcharged with impurities (vapors,) which displace positive electricity from the surface of the ground, and cause it to collect in the clouds. (Mueller, Lehrbuch der kos. Physik, pp. 697—8.) And again, Eulenberg (Die Lehre von den schaedlichen Gasen, p. 4,) states: "It is certain that ozon rapidly diminishes and ultimately disappears entirely in occupied and closed apartments, or in localities where miasma prevail; but to the contrary, *where the air is in motion or thrown into swiftly currents, the presence of ozon is strongly marked.*" (Italics are mine.)

3 Comp. Pflueger, Arch. d. Physiologie, vol. 1, p. 688, where is stated: Saliva of a dog containing as high as 64.7 per cent.

4 Comp. author's pamphlet on Variola, causes, nature, etc., p. 16

bloodvessels or in the cavities of the heart (principally on right side,) in apoplectic patients during hot and sultry weather. These coagula, if not redissolved by the lymph, (which contains Na. Cl.,) naturally undergo the regressive (ammoniaco-derivative) metamorphosis.

Under terrestrial exhalations, mere imparting to the atmosphere an undue proportion of carbonic acid and carbureted hydrogen gas, thus also depriving it of the property normally to oxygenate the blood in man, analogous morbid changes necessarily will occur in proportional percentage as the inhabitants are thereto exposed.

In view of these self-evident truths it is important to bear in mind, that alluvial formations contain large proportions of humus soil, and but a minimum proportion of aluminous and soda salts (viz: silicates of alumina and chloride of sodium,) and that in the ratio the soil being rich of the humus proportion, in the same ratio carbonic acid and carbureted hydrogen gasses are evolved, displacing ozon from the atmosphere, and predisposing to disease. But on the contrary, where localities are situated upon sandy (silicious) or clayey ground, or where chloride of sodium is found close to the surface, or is exposed to the influence of the air in form of saline works, ozon is predominant, and when atmospheric ozon exists in excess of the yearly mean, diseases of the bilious type (choloses) do not prevail.[1]

Specificists are still determined to couch all scientific facts that relate to cholera ætiology into garments of their notions, in order to lend them an appearance of plausibility; thus Pettenkofer alludes to telluric influences, congenial to cholera, as "constant" and "variable" elements. In reference to geognostic formations, the constant elements are said to be the chemical constitution, and the physical aggregate of the soil: the niveau of the surface (regional altitude?) Under the head of the variable elements are mentioned: temperature, organic substances, subsoil water and subsoil air. Further more: "If a certain influence on cholera is to be attributed to clayey soil, from all probabilities could not only the chemical substances therein be engaged, but their properties (physical?), in contradistinction to the variable elements air and water"

1 For verification compare Ebermayer on Atmospheric Ozon, in Zeitschrift fuer Meteorologie, Vienna, 1873, Vol. VIII, Nos. 22, 23 and 24.

Probably by the potency of the evidence there produced and here above constanted, the inconsistent nomenclature of "zymotic" and "infectious" disease may find its long seeked tombstone.

After this circuitous course, the facts could no longer be receded from, that "the maximum of carbonic acid of the soil is rated synchronously with the highest degree of its temperature.[1] This is an important fact, in conformity with the view advocated in this treatise, of the physical nature of the causes—and that of the perverted physiological chemistry as to the nature of cholera.

Not only consistently, but evidently with the potency of predominance have the laws proved themselves sustained in the above given comparisons, and to the terrestrial exhalations are legitimately to be attributed the aggregate influence upon man, constituting the predisposing causes to cholera epidemics. Also the actual elementary agencies thus engaged, have conclusively been indicated.

In a great measure, the atmospheric and cosmical influences have also been indicated, purporting the same object; some of the special agencies, which are to be regarded as the exciting causes, have passed a cursory review.

Now to each of the special influences, agencies, or elements, the explanatory and sustaining evidence, direct and collateral, must yet be enjoined, and simultaneously, the mode of their development, and the conditions under which they constitute an essential factor in elucidation of the synthetical development and ontological characteristics.

Knowing positive electricity or ozon to be displaced from the atmosphere, which immediately surrounds a certain locality, by the telluric exhalations of carbonic acid and carbureted hydrogen gas, thereby causing the barometrical minimum, under which physiological processes deviate from the normal standard, it can consequently not be difficult to understand what special physical influence must react, in causing sickness to assume special or an epidemic form.

The decline or ultimate extinction of the epidemic character (of cholera, here in point of interest,) the morphological modality, is on a parallel with the diminution and seizure of the meteorological influences, for when the normal state of the atmosphere, corresponding with season and climate (in the temperate,) prevails, no indication of any form of epidemic diseases is brought to notice.

These features, in the general sense, are expressed by

1 Cholera-Frage, pp. 81—82.

the ordinary seasonal differences, pursuant to which the character of the prevailing sickness is modified. The other striking and direct illustration, is the extinction of yellow fever by frosty weather, or when the thermometer indicates zero. But the most special form, in relation to cholera, of the reactions of cosmical or meteorological causes, (variable causes, according to Pettenkofer,) are the mitigating influences (diminishing the disease in frequency and intensity) are thunderstorms, by the eruption of electrical tensions and barometrical minima, ozon or positive electricity again descend to the surface of the earth, and atmospheric pressure and temperature are equalized; the state of the weather again approaches that, normal to the respective season and climate.

By the following data, testimony is borne in illustration and verification of the facts above set forth: At Paris, in 1849, when the summer temperature was unusually high (of an "unerhoerte Hoehe,") the rate of mortality from cholera, during the first eight days of June, ranged from 800 to 900. On the 9th of June a severe thunderstorm discharged over the place, and from that day the disease and mortality markedly declined (to one-third.)[1] At Calcutta, in 1869, in the month of June, a remarkable reduction of the frequency of cholera was observed after (on the 9th) a waterspout (cyclone) had disengaged over the place.[2] At St. Louis, Mo., in 1866 on the 12th of August, Dr. Engelmann records,[3] the thermometer indicated over 100° F.; a violent thunderstorm, followed by rain, discharged in the evening of that day.

To indicate the effects of the state of the weather upon the course of the disease, coinciding with the observations of Dr. Engelmann, the table of admissions of cholera patients to the City Hospital of this place, during the period the epidemic prevailed in the summer of 1866, may here be reproduced[4], where the rate of admissions is expressed in form of percentage of the population of the city, and thus it may be a fair index of the increase and decrease of the epidemic. Although the table does not indicate an abrupt decrease after the 12th inst., however in second following week the decline is precipitous, when "a period of delightful, clear, cool and bracing weather" prevailed.

1 Lebert, Ziemssen l. c., pp. 355, 383.
2 Pettenkofer, Cholera-Frage, pp. 55, 57.
3 St. Louis Med. and Surg. Journal 1866, No. 5, p. 468.
4 St. Louis Med. and Surg. Journal, 1867, No. 1, p. 41.

ADMISSIONS FOR THE WEEK FROM:	
July 27 to Aug. 3	0.025
Aug. 3 " " 10	0.188
" 10 " " 17	0.500
" 17 " " 24	0.525
" 24 " " 31	0.228
" 31 " Sept. 7	0.125
Sept. 7 " " 14	0.130
" 14 " " 21	0.090
" 21 " " 28	0.040
" 28 " Oct. 5	0.045
Oct. 5 " " 12	0.035
" 12 " " 20	0.005

Or the remarkable fact may be seen corroborated by more extensive evidence, by the table of the mortality of cholera at St. Louis, during this period:[1]

WEEKS ENDING:	NO. OF DEATHS.
Aug. 3	5
" 10	120
" 17	754
" 24	991
" 31	520
Sept. 7	495
" 14	294
" 21	203
" 28	81
Oct. 5	30
" 12	19
" 19	6
" 26	4
Nov. 2	3
" 9	2
Total	3527

Whatever interpretation may be construed in regard to the bearings of the evidences here set forth, the fact can not be denied: when the atmosphere represents the mean of its normal state--i. e. in addition to the normal degree of temperature and barometrical pressure the mean or an excess of positive electricity or ozon--epidemic diseases can not occur; and when they have occurred under atmospherical alterations, denoting an abnormal state, upon the return of the normal condition, epidemics decline and ultimately disappear.

1 St. Louis Medical Reporter, Dec. 1, 1866.

As far as to geological formations and to geographical configurations, within the physiographical boundary or isometrical line, local influences are to be ascribed to the development of the essential conditions, under which cholera is enabled to occur, and to assume an epidemic character; or to the contrary, if local influences, arising therefrom, prevent the development of the disease, the history of five characteristic localities may be adduced, tending to afford illustrative testimony on the subject here under consideration.

Of the first class may be mentioned Munich, City of Mexico, and St. Louis, (Mo.,) where the geological formations would not seem essential to favor terrestrial exhalations congenial to cholera, but to the geographical configurations, more justly, importance is to be attached. The second class may be represented by Lyons and Fuerth (Bavaria.) The soil upon which Lyons is built, not only affords exemption, but chiefly so, from the topographical relations. At Fuerth, on the contrary, it is simply the soil which causes the exemption ("immunity"!?)

Still the shrewd dialecticians of the infectionists may be apt to draw parallels, showing where atmospheric inequalities and terrestrial exhalations prevailed, but no special form of disease. To this form of argument the facts reply: meteorological observations have hitherto recorded rather aggregate states of the atmosphere, and the more subtle shadings of which the special reaction produce special form of disease, are as yet, not available. The application of meteorology to the ætiology of disease, and the terrestrial exhalations, as modifying factors to the special state of the weather and its reactions upon the human organism, have not yet been sufficiently studied, in order to be beyond argument, but an adequate degree of evidence is already accessible to prove the dependence of cholera on meteorological and terrestrial influences, and to vanquish all speculations arguing to the contrary.

The cities of Munich and St. Louis are sometimes in peril from cholera, the City of Mexico less frequently so. Munich is located in 48° 9′ lat., 11° 36′ long., at 1573 feet altitude, upon calcareous-pebbly ground (Gerœll-Boden[1],) and with a yearly mean of temperature of 7° 28′ bordering on the Isar river, in the basin-like plain, which is bounded southwardly by the mountain chain of Tyrol

1 Pettenkofer, l. c.

with an altitude from 2000 to 8000 feet; east and north-eastwardly by the "Bœhmer-Wald," a mountain range of medium hight, from 2000 to 5000 feet; north by the "Thueringer - Wald" and "Fichtelgebirge", also of medium hight, from 2000 to 5000 feet; westwardly by the "Schwæbische Alpen," of the same hight—2000 to 5000 feet. St. Louis in lat. 38° 36′, long. 89° 36′, alt. 550 feet, with a yearly mean temperature of 10° 20′. Situated upon partially alluvial, but chiefly upon clayey, undulated soil, underlined with limestone rock, and in the broad Mississippi Val'ey. The city is supplied with water from the Mississippi river, taken at the extreme northern (upper) extremity of the city; the diluvium of the river is by far the most drift sand, and hence the water supplied by the waterworks—which is almost exclusively used—is of the healthiest kind. The City of Mexico is in lat. 19° 26′, long. 99° 6′, at an alt. of 7008 feet, and the annual mean temperature is 12° 70′. The lake Tezcuco nearly adjoins the city, and the plateau is a basin-like plain, seemingly to be coated with a layer of humus soil. The surrounding mountain chain is of far greater hight than at Munich, and also in closer proximity to the city. Commencing with the vulcano Popocatepetl, 16,620 feet high, in the south-eastern direction, from whence is extended a chain to connect with the extinct vulcano Toluca, 14,300 feet high in the south-western direction, and from thence extending entirely around the plain. The city is said to be extremely filthy, worse than Naples in Italy,[1] and the houses, in the greatest proportion, are but one-story buildings.

Lyons, in 45° 48′ lat., 22° 30′ long. of Ferro, at 169 feet alt., and situated upon sub-soil granite rock,[2] with a yearly mean of temperature—which approximately can only be stated, viz: that of Geneva, and which is 8 20′. The location is at the junction of the Rhone and Saone rivers, which empty into the Mediterranean Sea in direct southward direction; on the east side is an open plain-like valley, on the west side spurs of the mountain range of the Monts du Lyonnais elevating to an aggregate altitude of 1000 feet.

Fuerth is situated in the same basin-like plain of Munich, and borders on a small tributary (Regnitz?) of the Main, near Nuernberg. The locality presents, oro-

1 Dr. Ratzel, Letter V, March 1875.
2 Pettenkofer l. c. p. 68.

graphically and climatically considered, the same liabilities to cholera as Munich, but owing to its geological advantage—being located upon sandy soil (Sandboden)[1] — where the terrestrial exhalations are of the oxygen reaction, the place is thus exempt.

Reviewing the data which give expression of the local influences, arising from the geographical relations or configurations, or from the geological special substrata that determine the occurrence or non-occurrence of cholera of any of the localities mentioned; and additionally to bear in mind, that Munich, Mexico and St. Louis are representatives of that class, which is apt to generate cholera epidemics, Lyons and Fuerth representing the class which is exempt, the causes, therefore, of telluric (geological) origin, augmenting or mitigating the intensity of meteorological reaction, and the influences exercised by the physical and geographical configuration, originating or preventing cholera, must thus appear clear and comprehensible. Moreover, the proof may thereby be illustrated, that, if localities, owing to their geographical relations, predispose to estival climatical fluctuations during the season of the hibernal solstice, or predispose, during the summer solstice, to an accumulation of excessive heat, with a minimum of the salubrious state of the atmosphere, or if from the geological character of the soil, the elements are emitted that augment the deleterious reaction of extreme meteorological influences, even in less elevated temperature, cholera is favored to occur,

Further advertance may yet be justifiable, in view to elucidate the operation of the laws, engaged in causing local meteorological perturbations essential to the predisposition and excitation of cholera, and to let the importance come forth, to be coguizant of the totality of the physical and geographical relations, attributing to the ætiology of cholera.

St. Louis is also located in southern latitude, and thus presents highly elevated temperature during the summer solstice (sometimes exceeding 100° F.) Though the Mississippi flows directly southwardly, yet oceanic climate is not exhibited in its valley above Cairo (where the river does not freeze any more,) thus placing St. Louis within the boundaries of the continental climate. If there the wind blows from the south-east, carrying the continental

1 Pettenkofer, ibid.

or returning current of the gulf-stream from the coast of New Foundland, the temperature invariably becomes elevated, charging the air with moisture, reducing the barometrical pressure to a minimum, and resulting in excessive hot and sultry weather during the summer solstices. The prevailing winds are south-east winds, and more exclusively so during the months of June, July, August and September.[1] When then the wind veers westwardly, as naturally and actually it does (according to the rotation of the anemone, and to the records of Dr. Engelmann referred to,) the refrigerated air from the Sierra Madre and from the Rocky Mountains rushes in, causing abrupt and wide ranges of temperature, frequently of a greater difference than 40° F.

The local climatical peculiarities represented by the city of St. Louis, may scope to some extent with those of the city of Mexico, but differing somewhat with Munich. Munich is located further north by ten degrees of latitude than St. Louis, and twenty nine than the city of Mexico, but on a plateau representing isometrically the highest point of the cholera range. The distance from the mountains of the Alps does not well compare with that of St. Louis from the Sierra Madre and the Rocky Mountains, neither with that of the city of Mexico from the surrounding mountain chain, nevertheless by the warm and moist currents of air, ascending from the Mediterranean Sea in the valley of the Rhone and Saone, and moving along the western face of the Jura Mountains through the valleys of the tributaries of the Danube, is produced the barometrical minimum and an undue degree of elevated temperature, augmented by reflected heat from the soil, and by the hindered drift of the ventilating winds, which must frequently follow and naturally prevail. They (i. e. these currents of air) are neither readily changed, owing to the tendency of circuitous rotation in the basin-like plain of the counter current of air, when the transitory current ascends the mountain hights of the "Boehmer-Wald."

It must be remembered that in Germany the warm winds are from the south, south-west and west: the south-east wind (that following, by the rotation of the anemone,) when it drops the cold air from the 8000 feet high mountain tops of the Alps in the plain of Munich, collateral fluc-

1 Compare table: "Results of the meteorological observations, made at St. Louis within the years from 1836 to 1866." By Dr. G. Engelmann. St. Louis Medical Reporter, Jan 15, 1867.

tuation with sudden and marked reduction of temperature must also be experienced, as here as well the cold air presses toward the barometrical minimum. Perturbations (i. e. refrigerations) however, of excessive intensity are not apt to reach Munich very readily, on account of the limited distance from the Alpine mountains. This locality must hence have very hot, sultry and oppressive temperature during the estival season. The climatical characteristics of the city of Mexico may not be necessary here any further to be analytically investigated. Lyons must be attended by strikingly different climatical peculiarities. This place is nearly five degrees of latitude further south than Munich, though the temperature may not exhibit frequent, sudden and high elevations, for the southern gale from the Mediterranean Sea ascends uninterruptedly the valley of the Rhone and Saone, and sweeps over its plain in an onward current or motion, and thus, even during the warm season, the air does not become stagnant, or is forced into circuitous rotation, and neither overcharged with impurities of terrestrial origin. The mountain range of the Monts du Lyonnais, west of and in closer proximity to the locality, extends in the direction parallel with the current of the Rhone, and is of a sufficient hight (on an average 1000 feet) to mitigate the sudden and turbulent ingress of the north-western or the continental current of the air. On the east side the range of the Jura Mountains in a great measure prevents the sudden descent of the south eastern, eastern, and partially north-eastern current of refrigerated or cold air from the mountains of Switzerland. Therefore, as the place is not exposed to great meteorological perturbations, and yet having an unobstructed draft of the atmosphere, the climatical prevalence must be of the equalized oceanic characteristics, in which epidemics do not occur.[1] The proof of the validity of these observations is afforded by the fact, that since 1854 Lyons has not been visited by another epidemic of cholera. The causes of its occurrence in this year (i. e. the year 1854) are to be found in the un-

---

1 The occasial occurrence of epidemic diseases on vessels, sailing upon the oceans, does not invalidate the law here expressed, because under meteorological influences, adapted for the development of any of this class of diseases, habitation constitutes a most potent predisposing cause, the illustration of which will be found further below, by the history of the cholera epidemic of St. Louis in the year 1866.

Additional evidence may be found by the prevalence of cholera on ships transporting the Dutch troops from Batavia to Acheen in 1873; when landing Dec. 9th, cholera had decimated the ranks, and which is principally ascribed to the fact that the ships were *terribly overcrowded and covered with filth.*—*Westliche Post*, St. Louis, Nov. 13, 1874, p. 1, extracted from K. Ztg.

usual dryness,[1] by which the meteorological conditions characterize the year 1854; the summer heat must have been of an unusual high degree and of an undue long duration. Evaporation having been unduly great,[2] hence there must also have been a continual barometrical minimum, toward which the cold air from the upper strata must have descended, and thus producing occasional and intense perturbations, under the influence of which in man occurs the "locus minoris resistentiae," followed, as a natural consequence, by cholera.

Probably nothing could be added to make the laws pointed out any clearer, viz: that by the aggravation of essential meteorological influence and telluric exhalations, cholera epidemics are produced, and increasing in frequency and in intensity, inversely declining and extinguishing upon the returning of the normal state of the climate. But as usually expositions of simple truths are apt to encounter vehement opposition, inclined to ignore or to deny the most palpable fact when favorite ideas or doctrines, frequently involving self-interest, are brought in conflict, it may thus be expedient to adduce the following table, again copied from Pettenkofer's most valuable essay[3] which forcibly illustrates the precise coincidence of the occurrence of the greatest number of cholera cases with the extremes of the hot season (when the barometer indicates the minimum of atmospheric pressure,) and the decrease in the same ratio, as the temperature is reduced, approximating the normal status of the barometrical pressure and electrical condition (% of ozon) of the atmosphere. The table shows the number of cholera cases occurring in each month with the simultaneous quotations of the rainfall (a fair indication of the increase and decrease of temperature) at Calcutta[4] for the year 1870.

MONTHS.	CHOLERA CASES.	RAINFALL, In English inches.
January	171	0.77
February	259	——
March	257	0.03
April	381	4.30

1 Pettenkofer, l. c. pp. 76—77.
2 Ibid.
3 l. c., p. 54.
4 Ibid.

MONTHS.	CHOLERA CASES.	RAINFALL. In English Inches.
May	165	0.92
June	118	16.02
July	50	10.90
August	40	12.92
September	30	9.01
October	37	3.93
November	——	1.66
December	——	——

(The table given by Armand, l. c. p. 459, with reference to the number of cholera cases occurring in each month of the year at Cochinchina corresponds entirely with the one here submitted.)

Applying the result of the above table as the key to a series of tables here subjoined, in relation to other tables above stated, viz: those of the admission and of the mortality of cholera cases in the summer of the year 1866 at St. Louis, and then contrasting them with the summer of the present year (1876) of the same locality, when there no cholera prevailed, a testimony of high potency at once projects, again in support of the physical laws as the causes of cholera epidemics; their intrinsic nature and mutual dependence can not clearer be illustrated; their precise parallelism or coincidence cannot more perceptibly be represented. The first group records the meteorological peculiarities of the weather for the year 1866, when cholera raged from the 27th of July to the 12th of October,[1] setting in with the dry hot season,[2] and continued to increase until the temperature reached the maximum, then beginning to diminish in a ratio as the temperature reduced and the atmosphere re-assumed its natural state (i. e. proportionate to the climate), with an approximate normal percentage of positive electricity.[3] The second group registers the state of the weather but for the first of January to the first of September, (incl.) 1876. Comparing this

1 Few isolated cases, occurring until the 9th of Nov., are not here considered.

2 I quote here from Dr. Engelmann's records (St. Louis Med. Surg. Journal Nov. 5., 1866, p. 468): "After July 21st there was in fact no rain (with the exception of a light sprinkle on Aug. 7th) until Aug. 13th, while the July heat continued almost without intermission till then, and culminated on the day before (Aug. 12th), reaching a point above 100 degrees."

3 The sudden rise of positive electricity in the month of Aug., indicated by the table below, must have taken place after the discharge of the thunderstorm. The other apparent discrepancy, with reference to the highest percentage of admissions of cholera cases for the week from 17th to 24th of Aug., is mere the expression of the sudden reaction, *with an undue intensity*, of the atmospheric positive electricity or ozon. In illustrating the parallels drawn in the text, compare the tables noting the meteorological fluctuation, with those noting the percentage of admission and the rate of mortality of cholera already referred to.

series of tables with that of 1866, the extremes will be seen not to approach those of 1866: to the contrary, during the summer months of 1876 a temperate and an equalized state of the weather prevailed.

As already mentioned, the latter part of the spring season, or first part of the summer of 1876, was favorable to the development of cholera, owing to sudden and rather extensive fluctuations in temperature from 56° F. on the 20th at 7 A. M., to 90° F. on the 22nd of June at 2 P. M., and the temperature continuing to range from 72° to 90° F. to the 28th of June, and during this period sporadic cases of cholera occurred in our own private practice. These facts require prominent emphasis, *for the meteorological influences of the following summer season were not essential or adaptable to transmute the otherwise physiological processes of the human system into that morbid state of which the symptoms*—according to medical nomenclature—*indicate cholera.*

1866—TABLE A.

MONTH.	THERMOMETER IN F. SCALE		
	Max.	Min.	Mean.
January	55.0	1.5	31.8
February	69.0	9.0	32.6
March	81.5	14.0	41.8
April	91.0	33.0	59.8
May	87.0	41.0	64.2
June	94.0	50.0	74.3
July	98.0	62.0	81.7
August	100.5	48.5	74.5
September	87.5	39.5	63.3
October	79.5	30.5	57.7
November	73.0	25.5	45.6
December	53.5	8.0	33.5

TABLE B.

MONTH.	BAROMETER.		
	Max.	Min.	Mean.
January	30.510	28.975	29.690
February	30.236	29,108	29.736
March	30,078	28.895	29.645
April	29.913	29.152	29.467
May	29.670	28.802	29.441
June	29.827	29.091	29.465
July	29.704	29.360	29.517
August	29.739	29.128	29.511
September	29.804	29.206	29.526
October	29.985	29.040	29.612
November	30.039	29.135	29.553
December	29.985	28.989	29.570

TABLE C.

MONTH.	POS. ELECTRICITY.	RL. HUMIDITY.
January	5.9	75.1
February	8.1	70.6
March	5.7	69.1
April	2.1	60.6
May	2.3	59.7
June	2.1	66.0
July	2.4	68.2
August	5.1	66.7
September	3.2	81.8
October	7.0	71.7
November	10.2	72.5
December	7.0	76.8

TABLE D.

MONTHS.	Cloudiness.	Number of Days in the Month. Fair Days.	Variable Days.	Days with no Sunshine.
January	5.5	9	15	7
February	4.9	13	9	6
March	5.7	3	20	8
April	4.3	13	14	3
May	4.6	13	15	3
June	3.7	8	22	0
July	4.2	10	19	2
August	3.1	14	17	0
September	5.7	8	16	6
October	3.6	17	12	2
November	4.4	12	15	3
December	6.3	4	18	9

NOTE.—Tables A., B. and D. are copied from Dr. Engelmann's tables, table C. from those of Dr. Wislicenus, published in the St. Louis Med. and Surg. Journal, vols. III and VI.

The figures of the series of tables denoting the state of the weather of 1866, cannot fail to be noticed exhibiting marked differences to those of 1876 which are here to follow, but only extend to the 31st of September incl. The temperature and relative humidity will be found decidedly in excess, and barometric pressure reduced to a minimum during the estival solstice (i. e. of 1866.)

The table noting positive electricity cannot here be compared with one of 1876, as the facilities that were kindly extended[1] in producing these rather cursory mete-

1 Sentiments of obligation are tendered the officer, Wm. Finn, U. S. A., in charge of the U. S Signal Bureau of this place.

orological statistics did not embrace observations of atmospheric electricity. A copy of one of the tables, published by Dr. Wislicenus—the one of 1863—is therefore here embodied, although the year thus recorded exhibits rather a maximum degree of positive electricity, however, as far as ascertained, this year was free of the occurrence of any cholera.

January	16.9	July	2.8
February	15.9	August	4.4
March	13.6	September	4.8
April	8.8	October	12.5
May	4.7	November	12.1
June	2.0	December	11.5

In comparison with this table that of the year 1866 exhibits but a minimum degree of positive electricity. For this purpose the table is principally adduced, as it demonstrates ad oculos the contrasting prima facie evidence of the minimum of positive electricity coincidental (i. e. essential) to the occurrence and prevalence of epidemic diseases—cholera in special. The inference of the state of positive electricity to vary between the mean and the maximum for the present year, could otherwise have been arrived at, namely by calculation—viz: on the basis of the inverse ratio of the degree of relative humidity (i. e. the elasticity of watery vapor,) temperature and barometrical minima.

The tables now following, exhibit the meteorological condition of St. Louis for the present year, but, as mentioned, to the 31st of September inclusive, and without the data of positive electricity. They are also grouped after the manner of those for 1866.

1876.

TABLE A. THERMOMETER IN F. SCALE.

Months.	Max.	Min.	Mean.
January	61.5	22.0	42.1
February	66.0	14.0	40.9
March	69.2	22.5	39.4
April	72.2	42.7	57.3
May	80.2	50.0	64.8
June	82.2	54.0	76.3
July	87.0	67.5	78.9
August	84.7	68 5	75.9
September	——	——	66.8

TABLE B.

MONTHS.	BAROMETER. Max.	Min.	Mean.
January	30.610	29.625	30.112
February	30.590	29.656	30.112
March	30.538	29.418	30.013
April	30.252	29.592	29.647
May	30.247	29.727	29.970
June	30.065	29.610	29.897
July	30.107	29.833	30.299
August	30.186	29.877	30.027
September	——	——	29.996

1866—TABLE C.

MONTHS.	RELATIVE HUMIDITY. Max.	Min.	Mean.
January	81.3	41.0	60.4
February	88.0	42.6	60.7
March	88.6	44.0	69.4
April	84.6	26.6	50.7
May	82.0	41.3	56.7
June	91.3	47.6	65.8
July	82.6	51.0	68.0
August	85.0	52.3	70.5
September	——	——	70.6

TABLE D.

MONTHS.	Number of Days in the Month. Cloudy.†	Clear.	Fair.	Rainy.††
January	10.3	15.3	2.0	3.6
February	6.0	17.0	4.3	2.0
March	11.0	9.0	4.0	7.0
April	8.0	15.0	5.3	1.6
May	11.0	13.3	5.3	1.3
June	9.6	9.6	8.0	2.6
July	6.0	15.6	8.6	0.6
August	5.6	17.0	7.6	0.6
September	10.0	10.0	10.0	—†††

These tables are condensed copies of the tri-daily observations of the "actual state of the weather," taken at the Observatory of the United States Army Signal Service of this place.

The tables of 1866 bring to view a continental climate with extensive variations, developing under severe perturbations to the climax, then gradually declining. The epi-

† Includes Fog. †† Includes snowfall. ††† Rain fell on 12 days.

demic of cholera pursued a perfectly parallel course synchronous with these inequalities: development, climax and decline.

The tables of 1876 exhibit a state of the weather approaching more the peculiarities of an oceanic climate, under whose influence the state of the general health, comparatively speaking, was not disturbed. This fact is amply verified by the unusual limited mortality of this city for the summer or even the year, when sometimes the weekly rate fell short of one hundred.

No disease of special note was prevalent, only cholera infantum happened to children while in the period of dentition. During the first months of the year, sporadic cases of variola, scarlatina, rubeola and urticaria, sometimes complicated with angina-pectoris, were observed, but toward the middle of May, when the weather commenced to assume the ordinary estival character, these classes of diseases disappeared. With the decline of temperature, rather in the latter part of August, bilious-congestive fevers became manifest, and continued to prevail to the end of October; however the list of average mortality was not increased, as most all the patients thus afflicted recovered. Since the second half of September, cases of diphtheria sprang up, and have not yet abated (end of November,) which in some instances ran a high course, and terminated fatally.

This digression may be justifiable, as it contributes to sustain the law: physical or meteorological influences being the causes of the occurrence and nonoccurrence of diseases that naturally tend to prevail in form of epidemics.

There now owes to pass a cursory view over the domain which tends to give countenance to the extent of the subsurface water and the soil attribute, by evaporation and exhalation, to the development of the predisposition; to inquire in what degree influences, congenial to cholera, are arising from the social state and habitation of the so-called "classes." Professor Pettenkofer[1] has with sagacity and zeal traced up the evidence (but in aid of his favorite view, that of specific infection, and which he believes to be multiplied and made more potential by evaporation of subsurface water,) that by evaporation the collection of carbonic acid gas in the ground is augmented, and such soil to con

1 Comp. Populaere Vorlesungen, Heft I, pp. 94—96.

stitute one of the pre-eminent factors in the production of cholera. The truth of the assertion is well proved by previous allusions above intimated, however in opposition to "specific infection," but in support of the physical causation of cholera; for undue exhalation of carbonic acid and carbureted hydrogen from the soil, as is now well understood, displaces ozon, or positive electricity, from the atmosphere, and thereby promotes disease.

Increased evaporation is said to be parallel to the sinking of the subsurface water, followed simultaneously by a superabundance of carbonic acid, exhaled by the ground. These incidental events are regarded as essential and to precede the occurrence of cholera; to prevail during the duration of an epidemic. But on more minute inquiry the axiom does not prove to be sustained, in order to correspond with the mathematical precision as the proposition would demand.

True, upon low and moist ground or porous soil, under influence of estival temperature, evaporation is augmented and telluric exhalation increased. The fact may be appropriately illustrated by the prevalence of the so-called malarial fevers among the inhabitants of paludal districts during the estival solstice, and their diminution and disappearance during the hibernal solstice—or by the winter frost. The stage of the subsurface water can thus not be brought in exact correspondence with the increase and decrease of the prevalence of these fevers, to which cholera generically appertains.

Applying the results of these observations as an index to the data, derived from a comparison of the stage of subsurface water with the appearance of cholera, a similar discrepancy becomes visible, which may lucidly be presented by the following notations: The stage of the water in the Mississippi River, at this port, exhibits for the cholera year—1866—14′.1 mean; 5′.7.—26′.8 extremes. For 1865—13′.2 mean; 1′.2—26′.7 extremes. For 1864—7′.6 mean; 1′.2—20′.3 extremes.[1] The years 1865 and 1864 rank with the present year (1876) with regard to the absence of fluctuations in the general health. The stage of water in the Mississippi for the present year (i. e. for ten months ending with the 31st of October) ranged thus[2]:

---

[1] The notations are copied from Dr. Engelmann's Meteorological Records, published in the St. Louis Med. and Surg. Journal. January and February Number, 1867, p. 64.

[2] "Zero of gauge low water of 1863;" report kindly furnished by officer Wm. Finn, U. S. A., in charge of Signal Bureau, St. Louis, Mo.

Mean 18 feet .50 inches; extremes: highest 22 feet .77 inches, lowest 13 feet .66 inches. Fully corresponding with the object here in view: to submit fair indications of the incorrectness of the advocated doctrine, that with the sinking (low stage) of subsurface water the appearance of cholera coincides, are the following data, derived from the profile view which the wood-cut, below inserted, exhibits. The wood-cut is a representation of the most densely inhabited section of the city of St. Louis, bearing a line with a course from south to north, and being the basis (i. e. the representation of the city directrix indicated by asteric at the foot of Walnut street and Levee) from which another line ascends in an inclining and declining course, indicating the elevation of the surface, respectively expressed by the figures at the bottom. An idea may thus be conveyed of the low surface of the eastern section of the "first and second districts" (district lines are the dark parallel lines with a course from the east to west,) and the more elevated surface of the eastern section of the "fourth district," where cholera prevailed with equal intensity, which again is indicated by the difference of the shadings. Moreover, the eastern section of the "first and second districts" embraces large tracts of "dumped" ground, which originally had been the river bed, containing in 1866 yet many open spaces full of stagnant water (sloughs and ponds) and being quite insufficiently provided with sewerage. Drainage, thus, of the subsurface water was limited.

The other section, representing the eastern division of the "fourth district," has an elevation of 63 feet, higher than the first indicated section, thus favoring drainage by natural declivity, and was then quite completely aided by sewerage, but cholera raged here actually the most intensely. The ground is covered with a thin layer of intermixed humus soil, under which the next following stratum is sandy loam of about twenty feet thickness, underlined with limestone rock.

Comparing the inferences that are to be derived from the data here indicated, with reference to elevated or low soil, high or low stage of subsurface water, the evidence grows conspicuous that upon undrained ground cholera occurs as well as there, where the subsurface water is more remote from the surface of the soil.

The kind of soil favorable to the development of cholera seems to be various; the most adaptable is evidently

that kind, from which gasses are abundantly emitted, that are deleterious to health, such as carbonic acid gas, carbureted hydrogen gas with ammonia. Ground the most prone to eliminate this kind of gasses, is the paludal and humus soil, but the next following would seem the porous soil, containing limestone at the surface (as in the case of Munich, where limestone-pebble is said to be the soil,) or being underlined with limestone-rock (as at St. Louis.)

Soil of which the exhalations are antagonistic to the development of cholera, seems to be (or is) that, of which by far the greatest mass is sand, and in exemplification of this, allusion may be made to Fuerth, (Bavaria,) where no cholera appeared, though in 1854 Munich suffered from cholera gravely; the usual commercial intercourse had not been interrupted of the two places, thus favoring, as to "portability" an abundance of opportunity for "infection;" and in addition to this, a large proportion of the population of Fuerth is living in poverty and filth, yet the place was spared.

The surface of the ground upon which Fuerth is built, is also to some extent slanting, and thus exhibits differences as to shallowness of the subsurface water, but of the comparative health no fluctuations are mentioned, as under the salubrions influences of the prevalence of atmospheric oxygen upon sandy soil, health is maintained. The superficial stratafication of the soil is said to be as follows:

Upper layer—a mixture of humus ground, $1\frac{1}{2}$ in. thickness.

Second layer—sand, 10 feet in thickness.

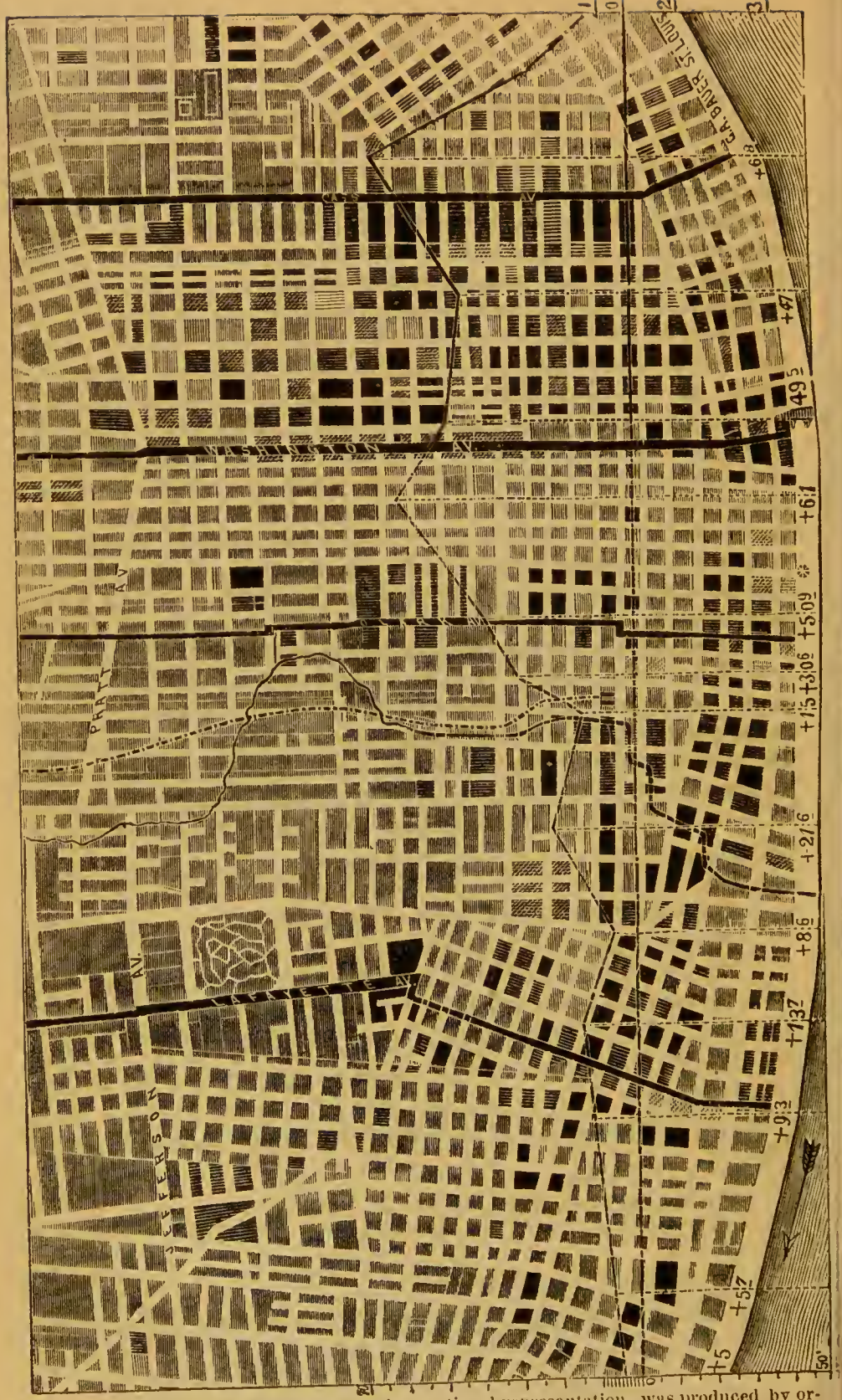
Third layer—clay, 2 feet in thickness.

Fourth layer—saliferous and gypseous shales and sand stone (Keuper) rock.[1]

At last, habitation and personal police must be mentioned, as progenitors of the predisposition to cholera; in behalf of this fact, potential proof is to be derived from other predominant facts indicated by the woodcut on next page.

---

1 Pettenkofer, Cholera-Frage, p. 41.



The map of which this woodcut is a sectional representation, was produced by order and under direction of the St. Louis County Court 1866, and is thus to be received as an authentical record. (For explanation of woodcut see the beginning of this book.)

If this representation or sketch may now be viewed with some attention, the most striking feature will be observed: the northern part of the "third district," including Chestnut. Pine, Olive, Locust and St. Charles streets and Washington avenue, not to exhibit cholera at all from a line west of Fourth street, where the most comfortably situated class of the population resided; the most precipitous contrast is noticed immediately at the boundary line in the "fourth district," for which no other cause is admissible than simply the differences of habitation and personal police. In this district cholera raged most intensely, and with almost an exclusiveness in those squares inhabited by the most needy proletary.[1]

These facts testify emphatically to the validity of the proposition: influences arising from low form of habitation and personal police, are actively engaged in the promotion or development of cholera.

No argument to the contrary can here be introduced, because the soil of both districts is alike in the geological sense, and topographically of the same elevation.

To facilitate the ready examination of the various parts of the section of the city, represented in the woodcut, with regard to elevation of surface, nature of soil and kind of classes of the inhabitants, it was thought expedient to subdivide it into districts.[2]

First district is limited by Lafayette Street and Lafayette Avenue.

Second district by Myrtle Street and Clark Avenue.

Third district by Washington Avenue.

Fourth district by Cass Avenue.

Fifth district by North City Limits.

In the eastern section of the first and most entirely that of the second district, the ground is low and chiefly of alluvial formation; also being filled up by "dumping" with the rubbish and debris of the city. In 1866 the inhabitants included some of the less wealthier, manufacturing and laboring classes, but a large proportion numbered with the proletary.

In the eastern section of the third and fourth district, the ground is elevated and with an eastwardly declivity.

---

1 Compare for similar observations "Cholera Epidemic of 1873 in United States," pages 240 to 249.

2 Repetition, which could not well be avoided, may, it is hoped, be kindly tolerated.

The stratafication is: an upper thin layer of humus soil, followed by the already mentioned loamy and sandy loam stratum, of considerable thickness, and under which the limestone rock is found. This part of the city was then the principal commercial centre for the wholesale trade, and hence the largest number of houses was not occupied for dwelling purposes. However on Front Street, on alleys, on Second Street, and on those streets running east and westwardly, there were numbers of boarding houses, refreshment saloons, stores and shops with dwellings, quartering a large number of inmates, and in quite unadapted apartments, as to sanitary rules.

The eastern part of the fifth district approaches in character, as to soil and inhabitation, that of the first and second district.

Similarity of surface and nature of soil is met with in all the districts west of the line, indicating the basis or the city directrix, with a course parallel to Sixth Street, with the exception of "Mill Creek Valley and Chouteau's Pond," (containing Pacific Rail Road Depots, Union Railroad Depots and Mill Creek Sewer,) where a rich alluvium and humus soil is found; this region was then not greatly inhabited.

The first district, west of the line indicated, was not densely inhabited, excepting that part from Sidney (the southern margin of the sketch indicated by the woodcut) to Lafayette Street, mainly by the laboring class.

The second district was nearly throughout densely inhabited, excepting Mill Creek Valley, and embracing mostly all the shadings of society.

The third district being also densely inhabited, but its population admitted of two divisions, the "middle classes" and the "most comfortably situated classes." The first class inhabited that part from Clark Avenue to Chestnut Street, (already referred to,) and from this street to Washington Avenue the part was exclusively inhabited by the second class.

The fourth district was the most densely inhabited throughout: in the southern half, including a number of the better situated class of society, in the northern half was quartered in overwhelming majority the proletary element, devoid of all education, and frequently found in the utmost indigent circumstances; also embracing the headquarters of the greatest of social miseries: the dens of prostitution.

The fifth district was less thickly inhabited, and included but a minimum proportion of the pauper element; the greater majority of the population ranged with the middle classes.

In drawing parallels to contrast the diametrically opposite results of the third and fourth districts, no other conclusion can be arrived at, than the causes of their dependence are to be found in the opposite states of habitation and personal police; on the one hand complying with, and on the other totally neglecting sanitary rules. The inhabitants of the exempted part of the third district avoided the "locus minoris resistentiae," but those of the fourth district developed it.

The object of this essay might here have been accomplished, but owing to the apparent plausibility, cast by means of eloquence and dialectic glitterings in favor of the BELIEF: cholera to be a disease produced by an undemonstrable peculiar "specific infectious entity," which developes outside the human organism (the exotic parasite,) and the disease not to occur unless the "specific infectious entity" finds access to individuals, who consecutively manifest symptoms, by which in medical terminology cholera is designated, but the modus operandi remaining inexplicable; also to the delusions, which from all appearance are purposely upheld by authority seeking aspiration, captivated by shallow didactical infallibilities, and by servitude of tyrannical oppression, sailing under the colors of "quarantine protection" and "innoxiousness by disinfection," (rather analogous to an exorcismus,) the nature of cholera (i. e. the cholera process) requires, therefore, here to be examined, in order again to unmask fiction, and also here to elucidate and establish truth and reality.

Modern scientific investigations point to clearness and to the promotion *of the understanding* of the actual nature of things. Every problem, remaining hitherto occult and intricate, is thereby simplified and made lucid; by means of the gathered positive knowledge, competent analogies and unbiassed philosophical convictions, is brought in conformity to other processes in nature, which are identified and understood. Hence, to manifest tendencies—either of a willingness, or an unwillingness, to acknowledge truth as it is, is no longer within the compass of propriety, because the epoch of "caprice" and "preference," based upon preternatural assumption, crude power and

unnatural deprivations of mind and means, is now antiquated and "in duty bound," "*common* welfare," "universal development and enlightenment" has taken the place. The present state of our knowledge and the tasks of humanity can not bear to see the multitude standing target any longer to the few, for trying systems or maxims that are in their bearings irrelevant or incompatible to the natural rights of man, vested in him by his existence.

Efforts of the greatest magnitude, calling into requisition the profoundest knowledge and the climax of human sagacity to grapple nature's reality, were demanded and have not been shunned, merely to establish, at periods, one single fact,—frequently being plain and self-evident. At the present similar demands stand foremost in order to elucidate one object, the subject matter of this treatise.

To overcome ambiguity or the remnants of a dualistic corruption, which yet seems to overshade the minds with an adiaphanous mist, or in other words: to lift the curtain of the "vailed picture of Sais," and to view nature's phenomena in clear daylight, it is therefore unavoidable to glance over the elements essential to primitive life actions, and over the conditions under which they are manifested; and owing to their (apparent rudimentary) simplicity inquiry has been rewarded with divulging from them the secrets of vital processes.

If research of natural phenomena begins with the simplest or elementary form (units,) then gradually progressing to the multiple forms, comparing and connecting them in a chain of generic succession, to the highest forms of animal development—to man—a basis may be found accessible to judge life manifestations rightfully and competently; also for excluding error from the understanding of diversions from the normal course—viz: disease—which under special influence assuming special form (e. g. cholera.) In view of these observations, the primitive geological processes may first be alluded to; those of the second series, the vegetative,—and those of the third, the animal (primitive) processes or life manifestations (consecutively) in their turn. Whatever theory is acceded to, with reference to the first cause of action in geology—the neptunic, volcanic, or plutonic—one fact is universally admitted: from disintegration (i. e. decomposition of existing forms) the impetus is derived for new action and new formations. The material of the preceding forms suffering reduction to

ulterior—primitive—forms or combinations, and being converted into an "amorphous" or pulpy mass, to which the sedimentary substances may be regarded the synthetical analogue.

In sedimentary substances carbonate of lime is largely represented, and owing to its proneness to decomposition, readily expels its equivalent of carbonic acid; as water is essential to sediments, carbureted hydrogen gas must also be evolved. Those ingredients of strong chemical affinity will enter into combinations as to be qualified for stratifications, and those whose physical properties qualify them for appropriation in the vegetative world, will there be actively engaged in the constructive metamorphosis. Thus the difficulty may not appear great to perceive the correctness of the universal law: disintegration being the antecedent motor to constructive action—i. e. in the elaboration of "plasma," and in which the evolution of gasses is evidently the principium moves. Hence in the inorganic world indefinite "plasmatic" forms precede the definite "typical" forms, and the elements predominantly therein represented are lime, silica, alumina and water. Owing to an augmented susceptibility, to be readily influenced by surrounding conditions, lime, from its proneness to suffer decomposition, evolves the motory momentum in form of gasses—carbonic acid and carbureted hydrogen (?)—and is thus with facility appropriated by organic structure, carrying with it silica and other inorganic substances.

In the vegetable economy the same law is in operation. From disintegrated old forms new forms spring up; but before the material of the old forms is appropriated, it also is reduced to the "plasmatic" composition, i. e. to the vegetable albumen (admitting readily to be decomposed under evolution of carbonic acid and carbureted hydrogen gasses,) from which development takes its origin, to be represented by an humble mushroom as well as by the majestic "Bigtree" (*Thuja gigantea*) of California, and by the rest of vegetation. In the synthesis of vegetation (constructive metamorphosis—assimilation—growth) these fundamental processes form the basis of the various shadings: from the "protoplasma" is derived the chlorophyl, starch, cellulose, lignine, the coloring matter in the endless variety of beauty,[1] the fragrance of the most delicate scent, as also the pungent odor of floral aromatic bouquet.

[1] Coagulated albumen, redissolved by muriatic acid, assumes a reddish-blue color. (Hints as to the action of chloride of sodium in plants on the floral colors.) Comp. Pierer, Universal-Lexicon, Vol. 1, p, 276.

The prosperity or premature decay of any of the representatives of vegetable life, is dependent upon external or surrounding conditions, and pursuant to their chemical constitution (in kind and proportion) their genealogical duration may be determined.

In the animal economy, processes subordinate to the same laws are continually transpiring: all previously existing forms, before they can serve any consecutive synthetic form, must, like in the mineral and vegetable world, undergo disunion and decay (cleavage,) and must be reduced to the most simple or primitive compositions, from which life manifestations take their origin only. The first step, therefore, in animal progressive metamorphosis is also the formation of albumen to which carbon, hydrogen, nitrogen and oxygen (and to some extent sulphur and phosphorus) are the genealogical antecedents; by their atomical re-arrangement (synthetic combination)—the con sequence of physico-chemical action—albumen is elaborated, and to which, apparently, lime is intermingled (in the form of a carbonate and silicate) in the process of formation.

This organic elementary substance, also in the animal economy is prone to decomposition, and likewise to evolve carbonic acid, carbureted hydrogen—and ammonia—the products of decay; but in this state of regressive metamorphosis "spontaneously" (i. e. involuntarily and forced by the evolution of gasses) primitive cell formation is taking place,[1] resulting in parental cell proliferation with "free" motion.[2]

The truth of the observations here intimated, is easily corroborated by investigations of the development, and by the study of "life" manifestations of "zoospores," "spyrogera longata," "arcella vulgaris," "amoeba diffluens"[3] etc., in which the apparent "free" (voluntary) motions are seen to be but *forced* actions, produced by the development of

---

1 e. g Protomyxa aurantiaca. Bathybius Haeckelii, Haeckel, l. c. 379.

2 The proper way, leading to the understanding of the phenomena of vegetable and animal life, is in principle no other than the one which the scientific inquirer pursues to penetrate into the causal connection and nature of objects of the inorganic world, viz: that of instituted exact observation, corresponding with the general rules of critiques; most always is it leading to the conformity of the principles with the facts of isolated particulars.

"A clear view of the chemistry of organic nature can only be obtained, if inquiry is commencing with the origin, the most simple or the primitive forms of life manifestations."—Gorup-Besanez, Lehrbuch der physiologischen Chemie, 3rd edit., pp. 1 and 7.

3 Reference may be had to: Engelmann (Utrecht,) Beitraege zur Physiologie des Protoplasma, Pflaeger's Archive der Physiologie, II, 307; Sachs, Lehrbuch der Botanik; Robin, Anatomie et Physiologie cellulaires; Hilgard, vide Both on Smallpox; Virchow, Cellular-Pathologie, 4th edit., chap. XV.

gasses within them (in consequence of the process of oxidation—decomposition—of the albumen) which are lighter and rarer than the medium in which they are suspended. Moreover, if remembered, that the albumen, from which these named bodies are derived, and to which in composition they strongly relate, is more or less of alkaline reaction, owing to the equivalent of nitrogen, and pursuant to which, under additional access of oxygen, it is fermentatively oxidized, developing carbonic acid, carbureted hydrogen and ammonia. The "albuminoids" are thus "vividly" *propelled*, in directions where the medium (water) offers the least resistance.

By means of hydrolytic influences, compounds of this description may be converted into suboxides (anhydrides) which in the human organism seem to constitute the material for oxidation, i. e. for the evolution of "vitality," (progressive metamorphosis,) and the "albuminoids" appear to form the basis of "ammoniacal derivates," of which the natural tendency is disintegration (regressive metamorphosis.) Consecutively assumed forms (i. e. in the human organism,) constituting the representatives of one (progressive) or the other (regressive) metamorphosis, must lead, in accordance with their constitution and forced tendency to action, when predominant, "on the one hand" to maintenance of health and life, and "on the other hand" to disease, and ultimately to death.[1]

In regressive metamorphosis, albuminoids evolve gasses analogous to those that are met with in, or are produced by decomposition of the primitive compounds in the inorganic (geological) and vegetable world,[2] viz: carbonic acid, carbureted hydrogen and ammonia,which are incompatible to life. Thus an analogy is fully traceable, proving the identity of subordination to the physical laws, active in the inorganic, vegetable and animal world, either in the constructive (progressive) or destructive (regressive) metamorphosis, determining the natural duration or a premature end of life. The difference of intensity of reaction of these laws must be recognized as the conditio sine qua non of the occurrence of disease in general and in special.

Suboxides may be regarded anhydrides, free of nitrogen, produced in the human organism by the process of

1 The observations here embodied may serve as an answer to the interrogations of Prof. L. S. Beale, emphatically asked on p. 55 in the little work on Disease Germs. Philadelphia, 1870.

2 The word "kingdom" would seem objectionable.

digestion of amyloid substances. Ammoniacal derivates as the secretion of glands, whose fluids are ammoniacal and cannot be converted into the first class by "cleavage." Thus "albuminoids" subject to hydrolytic fermentation previous to their entering the circulation, and being taken up by the absorbents unconverted, impart to the blood gasses, arising from their regressive decomposition which in quality are highly deleterious to health, and in quantity most dangerous to life. For enample: if the secretions of the liver, which primitively must break up into glycogen (a suboxid) and into mucin (ammoniacal—in composition —derivate?) but should they remain in admixture, mucin would also be circulated through the lungs, there interfering with the proper oxidation of glycogen, and thus leaving an excess of material in the system (i. e. in the blood,) resulting in the formation of carbonic acid. The arterial blood would suffer a contamination, resembling an analogy to the state of the venous blood, and mucin, from its ammoniacal composition, would impart to it the lighter expandible and voluminous gasses: carbureted hydrogen and ammonia,[1] which would, of necessity, retard the circulation and *destructively* alter the composition of the blood.

Bearing now in mind the injurious effects on the human organism, exercised by extensive meteorological oscillations, when the blood has naturally been altered in the manner just indicated by the ordinary influences of the summer season, the circulation in any special organ (gland) of secretion is also morbidly retarded.

Stasis in the venous circulatory system, resulting from one or from all of the above enumerated causes combined, must naturally lead to structural changes, followed by interrupted and deranged secretions. The liver, kidneys and spleen (?) are the first and the particular organs thus affected. Stasis in the kidneys, as is fully known, is followed by albuminous deposits in the malpighian tufts, suspending the secretion of urine either entirely or partially in the particular anatomical territory disorganized.

Under special atmospheric differentiations (high degree of temperature, low barometrical pressure, and deficiency of ozon or positive electricity) the disturbed functions of those organs can not be compensated (by vicarious action

1 Logically, there can be no other issue, although physiologists do not yet accede to it.

of the lungs and the skin,) therefore if to the elements, already active in the regressive metamorphosis, urea and uric acid are added, pursuant to their retention from oppressed secretion, the general disturbance is absolutely augmented.

In what special and primitive form certain processes, on the regressive scale, with manifest special form of disease, and what special state (i. e. in a more precise manner as hitherto has been the mode of observation) of atmospheric influences will cause perverted physiological processes to assume special morbid characteristics (of an epidemic character in particular,) must for the present remain a task for future inquiry.

By morbid anatomical research, the substance infiltrating the glands of secretion (including the glands of the alimentary canal—even the mucous fallicles not excepted —) is proved to be albuminous; the inorganic substance, simultaneously deposited to be, by far in the greatest proportion, lime (Kalk.)[1] By this term, in the usual mode of employment, is understood the carbonate of the oxide of calcium.

Albumen represents but an inferior (loose) form of organic synthesis; admits of the convertibility into compounds of the series of the anhydrides, and under access of ammonia to be reconverted into albuminoids and ammoniacal derivates,[2] (with reference to vegetation) In man (or in the animal economy) glandular secretions are highly albuminous, derived from the digested nutriments, but which are disposed to an analogous convertibility by hydrolytic cleavage; and if to the "albuminoids" the access of chloride of sodium is excluded, so as to deprive or abnormally diminish these protoplasmatic fluids of their share of constructive (plastic) property, their predominent tendency to regressive action will prevail, manifested by ordinary decomposition and by the formation of primitively organized structure, such as: spores, zoospores, bacterii, "schizomyzeten."

1 Comp. Arnold, Virchow's Archiv, XL, No. 1, "Die Vorgaenge bei der Regeneration epithelialer Gebilde," p. 178, where is stated: "Dark granules are interspersed in the homogeneous and clear sedimentary mass (Grundsubstanz,) which are, accord. to Simon, 'Chemistry of Man,' lime." Mair, Virchow's Archiv, vol. XLV, p. 326: "hyaline sedimentary matter, interspersed with lime particles." Virchow, Lect. on Tumors (die krankhaften Geschwulste,) vol. III, p. 31. "Kalksteinsprengungen" in struma gelatinosa.—Paget, Lect. on Surg. Pathol., 3rd edit., p. 143.—The author's treatise: Cause, nature &c. of Variola, p. 25.

2 According to Pasteur yeast cells *develop without having albuminous substrata, but consecutively exhibit an albuminous composition.* Rochleder and Kekule assert: starch and ammonia to form albumen. Comp. Hofmeister, Physiologische Botanik, pp. 345-6.

Within higher organizations and under less destructive influences: cytoblosts, endosperms, ovules, amoeboid cells, ovula spermatozoa etc.

The development of fungoid products, met with in the dejections and secretions of cholera patients may be more readily understood, if in the natural history of these growths the fact, particularly, is borne in mind, that ascopores develop directly from protoplasma (an albuminoid) by "free" cell formation.[1]

These fungoids are but products of the regressive metamorphosis of the vegetable or animal albumen, in the state of disintegration or decomposition, to which it is readily liable, owing to its "loose" form of synthetic construction, and carrying with it large quantities of carbonate of lime. Under evolution of carbonic acid, carbureted hydrogen with ammonia, which thus is prone to occur in an augmented proportion, physiological life actions in man are suspended or grossly interfered with, and developments on the regressive scale must take place, owing to physico-hysto-chemical activities. Their constitution is analogous to the ammoniacal derivates,[2] their function is: deoxidation (augmenting the evolution of carbonic acid, carbureted hydrogen with ammonia,) and pursuant to their "ammoniaco-mucinous" composition they are prone to decay and putrefaction.

More potential evidence is not at command than the data here related in testimony of human physiological processes to be subject to the reactions of physical laws; that by hydrolitic—chemico-synthetic processes of the albuminoids the life manifestations (archebiosis) are produced—in the sense of progressive metamorphosis (biostatics)—and that fungoid growths, though also life-manifestations, are however related to, or are the products of the regressive metamorphosis (necrobiosis.) Consequently, *fungi* (immaterial to the terminology employed) *are not the cause of cholera, neither of any other "epidemic disease,"*[3] (infectionists are continually attempting to make others believe the contrary,) *but they are simply incidental products of the decomposition*, constituting the cholera process.

---

1 Sachs, Lehrbuch der Botanik, p. 221.

2 Comp. L. Hermann, Grundriss der Physiologie, p. 225.

3 This subject has been exhaustingly treated in the author's essay: "Epidemic Diseases," Article Yellow Fever.

4 The "germ theory of disease," advocated by Prof. Huxley, see Lecture on Yeast, Half-Hour Recreations, Popular Science, No. 8, vindicating "germs" the power of "in-

If these simple facts do not gratify the prevailing taste, it may be conceded, that, however, the object in view can not be altered, the intention is merely to give a statement of "les choses telles qu'elles sont," and truth as it is.

The pathogenesis and ontogeny of the cholera process fully verify the physiologico-chemical facts above enumerated, proving them to occur in the manner and in obedience to the laws indicated.

The premonitory symptoms generally usher in with diarrhœa, followed by vomiting, bearing testimony of the inability of the liver to separate (primitively to cleave) glycogen (a "suboxide" or an "anhydride") from mucin (an albuminoid or an ammoniacal derivate?) thus evolving large proportions of carbonic acid and carbureted hydrogen with ammonia—the light gasses--(pursuant to unhealthful external influences) which contaminate (thicken) the blood, and interfere with the circulation (producing venous stasis.) In part, it (i. e. the thickening of the blood) is owing to the voluminousness of these gasses that they interfere with the essential diffusion and oxi genation of the blood, but when these gasses occur in excess, they intensely press upon the pneumo-gastric nerve, and chemically irritate it by means of the abnormal composition of the nutrient blood, thus giving rise to violent vomiting. If by this effort the system may not be entirely freed of the incumbrance, but instead thereof exudations take place upon the mucous surface of the alimentary canal, in consequence of the stasis and counterpressure in the portal circulation, and from chemical reaction the epithelium suffering exfoliation the nerve filaments intolerable irritation leading to the suspension of the arterial capillary circulation, spasmodic contraction of the muscular tunic of the bowels follows,[1] and is thus violently expelling the transuded serum and exfoliated epithelum, by which are characterized the "rice-water discharges."

If the structure of other glands whose functions are

---

fection," may thus conclusively be proved illusive. The exemplification adduced: vaccination (i. e. in the generally accepted meaning of the term) a "healing disease," disseminating it "germs" throughout the system to the good of man, analogous to the "contagion of destructive diseases" reflects no advantage to the learned Professor, for immaterial what kind and form of lymph is used, its effects upon the system is but chemico-mechanical, and its results disastrous, and in a biological sense—pulmonary tuberculosis is one of its natural results.—See Virchow, Cellular-Pathologie, 4th edit., p. 261, and Both, Boston, 1873, Consumption, p. 111.

1 Muscular spasms follow upon suspension of the arterial circulation—Radcliffe, Pain and Paralysis, p. 98, — and exfoliation or dissolution of the epithelium, produced by dialysis, is based upon the alkalinity of the transuded fluids. Comp. Todd & Bowman, Phys. Anat p. 362.

indispensible to life—the kidneys f. inst.—has suffered a destructive albuminous infiltration, debarring the elimination of urea and uric acid (potential ammoniacal derivatives,) a total decomposition of the blood (by hydrolitic fermentation?) is most apt to occur, ending, to the relief of the patient, in death.

Are the glands of secretions but partially altered in structure, in order to afford an opportunity for re-assuming their functions upon the returning of the circulation, and if the blood has also suffered but partially from decomposition, convalescence will set in, resulting in recovery.

The excessive thirst, one of the greatest tormenting symptoms of cholera patients, is to be ascribed to the thickening of the blood, produced by the disintegration during the period of transudation of the serum from the blood-corpuscles. The general muscular spasms are dependent upon the interruption of the requisite supply of arterial blood in the tissue elements, partially due to the morbidly altered state of the blood, and partially owing to the suspension of the nerve influence of the sympathetic system, commonly exercised over the tunics of the arteries,[1] ("congestion of the nerves,") following venous stasis.

All other minor shadings and complexes of symptoms are of secondary importance; they indicate but varieties and different degrees of intensity of the nosological elements here considered, indifferent whether thereby "sporadic," "endemic," "pandemic" or "epidemic" cholera is denoted.

A few passing remarks may yet be devoted to the doctrine of "specific contagion," as conflicting with the laws of nature and promoting error, wrong and barbarian cruelty in the urging of the unscientific "quarantine restrictions" and "disinfections." Immaterial to the individuality of the exponent of the theory, whether active as promoter, or ranking with the gross of the faithfnl believers, to none can be vindicated even a shadow of right. If pertaining to the first class, so much the worse; there is competency of judgment and knowledge then ignored. But veracity and purity of character do not bear to oscillate like a vane from the "exotische Parasit" (Griesinger,) "Paramyceten" (Lebert,) "schaedlichen Stoff" (Pettenkofer,) to the "unangreifbares Contagium"[2] (Robinski,) which is said to in-

1 For special reference see: Todd & Bowman, Physiology of Man—Radcliffe on Epilepsy, Pain and Paralysis—Hoppe-Seyler, Chemische Analysen—Ludimar Hermann, Grundriss der Physiologie—Gorup-Besanez, Lehrbuch der physiologischen Chemie, 3rd ed.

2 For an additional list see author's "Epidemic Diseases"—Yellow Fever, p. 15.

habit the human body, but (horribile dictu) not being generated in it!? No quarters can be granted in the face of such caprice and fabrication, and no forbearance can be indulged towards these open violations of physiological chemistry, natural philosophy and natural history. It would be idle to expect categorical infectionists to concede to anything not identified with their speculations, notwithstanding how palpable and cogent facts are, guarding against error, since to maxims and narratives of specific contagion, actually monstrous, publicity is given which is received with apparent satisfaction, however but there where credulous vagueness is substituted for critical analysis and competency of judgment. One of the latest productions of this is: "Just as certainly as that contact of pre-existing syphilitic virus is necessary to produce syphilis, so certainly is the contact of the pre-existing cholera-virus necessary to produce cholera in any portion of the globe outside of Hindostan."[1] Another is the following narrative: "In 1867 at Zuerich, a laundress who had been washing the garments of a cholera fugitive, had taken the cholera and died, and from whom had emanated the centre of a consecutive epidemic."[2]

These enormities may be responded to by the following: In the year 1866, when, as above indicated, the author being resident physician to the St. Louis City Hospital, there were admitted 653 cholera patients, who were attended, in addition to myself, by four assistants, nursed and waited on by ten or twelve nurses; the soiled bedclothes and garments were washed by six laundresses;—but, oh wonder! none of them even took sick, nor died, and much less "infecting" the community.

Such precipitous contradictions—lamentable as they are to medical science—could not have come to existence, if the remnants of the dualistic doctrine were not dimming the objects of subjective study, and, therefore, interpretation of nature's phenomena were not forced into tendencies calculated to vindicate to "authoritative" rulings potency. But whatever maxims and antique usages may be gratifying to a subservient fancy, modern science, as the virgin representative of reality, cannot be coerced into speculative tendencies, and therefore: exit hypothesis and deception, but entree to reality and truth.

---

1 Woodworth, Cholera Epidemic of 1873 in the United States, p. 8, Note (Government Printing Office, Washington, 1875.)

2 Ziemssen, l. c. vol II, p. 366.

Inasmuch as there is but unity (monism) traceable in all the phenomena of the actions of nature, everything is in mutual dependence or of physical character, and nothing, as an exceptional individuality that could give countenance to health or disease—life or death, can be brought any more to *general* recognition, the prestige of dualistic negation or confusion,polished under dialectic versatility,is now, happily, fully outgrown by the understanding of nature's unity. Herein, however, lies the gravity of the conflict of reality versus fiction—of science versus superstition. Most conclusively is this expressed by Haeckel :[1] In the world (i. e. in nature) everything transpires but naturally ; each effect has its cause, and each cause is followed by effect—the law of causation. The "physical materialism" rejects decidedly superstition and miracles, and any form or idea of supernatural processes. In this sense nowhere, within the domain of human knowledge, can actual metaphysics be maintained, on the contrary, everywhere are but physical processes. Thus an inseparable connection (embodiment) of matter, form and force, is selfevident.

1 Natuerliche Schoepfungsgeschichte, p. 32.